

The Processing of *wieder*
(‘again’) and other
Presupposition Triggers

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1

Introduction

1.1 Goals of this Dissertation

This thesis is motivated by the fact that there is so little psycholinguistic research on presupposition triggers other than the definite article. The interesting features of *again* make it a good candidate well worth studying. All of the experiments presented in this dissertation were carried out in German. For the research questions I am interested in here, I am assuming that there is no relevant difference between *wieder* and *again*. As of now, there are many unresolved theoretical issues surrounding the notion of presuppositions (PSPs). Unsettled debates center around the question of how to classify PSPs triggered by different PSP triggers, and the projection problem (Karttunen (1973)). The experiments I present in this thesis will give us a better understanding of these theoretical issues. Furthermore, they will give us a more refined understanding of how semantic and pragmatic processing takes place. As of now, there is little to no psycholinguistic work that I am aware of which makes a tangible proposal of how actual compositional semantic processing can be modeled. With this thesis, I will take the first steps towards this goal and add a new angle to the theoretical issues mentioned above. I will do so in three subsequent steps. In a first step, I shall test experimentally how the PSP of *again* is processed in simple affirmative sentences (chapter 2). The results of this experiment will give us a deeper understanding of the processing of *again*, and they will reveal new insights into PSP accommodation (Lewis, 1979) which in turn will have consequences that extend to PSP triggers other than *again*. These consequences will be discussed and tested in a second experiment in which sentences with different

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PSP triggers (the definite article, the change of state verb *stop*, the additive particle *too*, and the factive verb *know*) will be investigated (chapter 3). We will see that there are substantial differences in the processing of these various PSP triggers that a theory of PSPs has to account for. This will lead to a new classification of PSP triggers on the basis of their semantic properties. In the third and final step, I will turn to more complex data and investigate the processing of *again* and the definite article in the scope of various quantifiers (chapter 4). On the basis of the results obtained, I will propose a new way of capturing the projection behavior of PSPs under quantifiers which I will then extend to other projecting environments like *if*-clauses and conjunction.

Before we dive into the theory of PSPs and previous experimental work on the processing of PSPs, let me lay out some preliminaries which I take as the basis of the theoretical discussion throughout this thesis.

1.2 Preliminaries

Unless otherwise specified, the discussion in this thesis will be couched in the semantic framework of Heim and Kratzer (1998). I follow their assumption that there is a logical form (LF) which is the syntactic representation that serves as the input for semantic interpretation. According to this system, every interpretable node in the tree has a type. Throughout this dissertation I will assume the following types.

(1) a. **Simple Types**

e	individuals
t	truth values
s	worlds
i	time intervals

b. **Complex Types**

If a and b are types, then $\langle a, b \rangle$ is a type.

The semantic interpretation function is written as $\llbracket \cdot \rrbracket$. There are certain rules of composition by means of which the meaning of a sentence is derived. The ones assumed

in this dissertation are listed below.¹

(2) **Rules of Composition**

- a. **Lexical Terminals** (H&K p.48)
 If α is terminal node occupied by a lexical item, then $\llbracket \alpha \rrbracket$ is specified in the lexicon.
- b. **Non-Branching Nodes** (NN) (H&K p.105)
 If α is a non-branching node and β its daughter, α is in the domain of $\llbracket \cdot \rrbracket$ if β is. In this case, $\llbracket \alpha \rrbracket = \llbracket \beta \rrbracket$.
- c. **Functional Application** (FA) (H&K p.76)
 If α is a branching node, $\{\beta, \gamma\}$ is the set of α 's daughters, α is in the domain of $\llbracket \cdot \rrbracket$ if both β and γ are, and $\llbracket \beta \rrbracket$ is a function whose domain contains $\llbracket \gamma \rrbracket$. In this case, $\llbracket \alpha \rrbracket = \llbracket \beta \rrbracket (\llbracket \gamma \rrbracket)$.
- d. **Predicate Modification** (PM) (H&K p.115)
 If α is a branching node, $\{\beta, \gamma\}$ is the set of α 's daughters, then α is in the domain of $\llbracket \cdot \rrbracket$ if both β and γ are, and β and γ are both of type $\langle e, t \rangle$. In this case $\llbracket \alpha \rrbracket = \lambda x_e. \llbracket \beta \rrbracket (x) \ \& \ \llbracket \gamma \rrbracket (x)$.

A huge part of the discussion in the second chapter centers around free and bound variables. For this, the following definitions are necessary.

- (3) a. **Variable Assignment** (H&K p.111)
 A *variable assignment* is a partial function from \mathbb{N} (the set of natural numbers) into D .
- b. **Traces and Pronouns Rule** (H&K p.111)
 If α is a pronoun or a trace, a is a variable assignment, and $i \in \text{dom}(a)$, then $\llbracket \alpha_i \rrbracket^a = a(i)$.

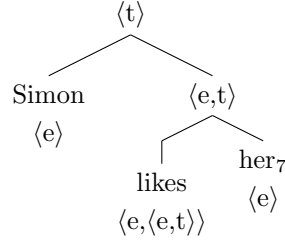
Below I will go through a sample calculation of the sentence in (4).² The relevant lexical entries are given in (5).

¹I am using the “more pedantic” versions of the composition principles here because they take care of the fact that PSPs have to be passed along in order to become definedness conditions for the whole sentence.

²I am going through this calculation in a *top-down* fashion because this will be useful once we start thinking about how processing takes place. Heim and Kratzer (1998, p.100) note that the *top-down* strategy also has an advantage over a *bottom-up* strategy in cases involving predicate abstraction.

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(4)



- (5)
- a. $\llbracket \text{Simon} \rrbracket^g = \text{SIMON}$
 - b. $\llbracket \text{likes} \rrbracket^g = \lambda y. \lambda x. x \text{ likes } y$
 - c. $\llbracket \text{her}_7 \rrbracket^g = g(7)$
 - d. $g(7) = \text{ANNA}$

- (6)
- | | |
|--|---------------------|
| $\llbracket (4) \rrbracket^g = \llbracket \text{likes her}_7 \rrbracket^g (\llbracket \text{Simon} \rrbracket^g)$ | FA |
| $= \llbracket \text{likes} \rrbracket^g (\llbracket \text{her}_7 \rrbracket^g) (\llbracket \text{Simon} \rrbracket^g)$ | FA |
| $= \llbracket \text{likes} \rrbracket^g (\llbracket \text{her}_7 \rrbracket^g) (\text{SIMON})$ | terminal node |
| $= \llbracket \text{likes} \rrbracket^g (g(7)) (\text{SIMON})$ | pronouns and traces |
| $= \llbracket \text{likes} \rrbracket^g (\text{ANNA}) (\text{SIMON})$ | variable assignment |
| $= [\lambda y. \lambda x. x \text{ likes } y] (\text{ANNA}) (\text{SIMON})$ | terminal node |
| $= [\lambda x. x \text{ likes ANNA}] (\text{SIMON})$ | lambda-conversion |
| $= 1 \text{ iff SIMON likes ANNA}$ | lambda-conversion |

1.3 Theoretical Background on Presuppositions

The linguistic world became first aware of the notion of presuppositions through Frege's (1892) work on definite description which later culminated in the famous argument between Russell (1905) and Strawson (1950). Since then, lists of so-called presupposition triggers have been proposed, which include a number of linguistic expressions in addition to the definite determiner, and many theories which try to capture and explain the behavior of PSPs have evolved. In this chapter I will give an overview on the general properties of PSPs and some of the most influential PSP theories in the literature.

1.3.1 Properties of Presuppositions and *again* in Particular

Despite the many different theoretical approaches to PSPs, there is the unanimous opinion that a PSP is a meaning component conveyed by a sentence which behaves

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differently from the normal, asserted meaning of the sentence. Yet, they are also quite different from phenomena such as (conversational) implicatures. One of the main features which makes PSPs different from the asserted meaning and (conversational) implicatures is that they survive certain embedding operators such as negation (7-b), conditionals (7-c), modals(7-d), and questions (7-e). This kind of behavior has been first reported in Langendoen and Savin (1971) and was later taken up as a test for PSPs and consequently called the *Family of Sentences Test* (FoS) by Chierchia and McConnell-Ginet (1990).

- (7) a. **Simple Sentence**
Susan stopped smoking.
- b. **Negation**
It is not the case that Susan stopped smoking.
- c. **Conditional**
If Susan stopped smoking, she lives a healthy life now.
- d. **Modal**
Susan might have stopped smoking.
- e. **Question**
Has Susan stopped smoking?
- f. **PSP in a. - e.**
Susan used to smoke.

Ideally, all PSPs of a sentence should be shared background knowledge by all participants in a conversation (cf. Stalnaker (1973)). If this is not the case, PSP failure occurs. What this means exactly and how it is conceptualized differs from theory to theory. However, there seems to be a mechanism which can save the sentence from being totally deviant. This is what Lewis (1979) dubbed *accommodation*. In his original paper, Lewis characterizes accommodation in the following way (Lewis, 1979, p. 340):

If at time t something is said that requires presupposition P to be acceptable, and if P is not presupposed just before t , then – *ceteris paribus* and within certain limits – presupposition P comes into existence at t .

Since then, many scholars have been concerned with different issues concerning accommodation, and the notion of accommodation has been considerably refined (see

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Beaver and Zeevat (2007) for an overview).

Over the last decades, many linguistic expressions and syntactic constructions have been argued to cause PSPs to arise. The following list is quoted from Beaver and Geurts (2011) and is by no means exhaustive.¹

- **definite descriptions** (Strawson (1950), etc.)
The Prime Minister of Trinidad and Tobago stood up and wagged his finger.
PSP: Trinidad and Tobago have a (unique) prime minister.
- **iteratives** (von Stechow, 1996; Fabricius-Hansen, 2001)
Susan went ice-skating again.
PSP: Susan went ice-skating before.
- **factives** (Kiparsky and Kiparsky, 1970)
Berlusconi knows that he is signing the end of Berlusconiism.
PSP: Berlusconi is signing the end of Berlusconiism.
- **aspectual verbs** (Simons, 2001; Abusch, 2002)
China has stopped stockpiling metals.
PSP: China used to stockpile metals.
- **temporal clauses headed by *before*, *after*, *since*, etc.** (Heinämäki, 1974; Beaver and Condoravdi, 2003)
The dude released this video before he went on a killing spree.
PSP: The dude went on a killing spree.
- **manner adverbs** (Abbott, 2000)
Jamie ducked quickly behind the wall.
PSP: Jamie ducked behind the wall.
- **sortally restricted predicates of various categories** (e.g., *bachelor*) (Thomason, 1972)
Julius is bachelor.
PSP: Julius is an adult male.

¹I have changed the original order and added iteratives to the list since they are the core PSP trigger to be investigated in this thesis. Some of these PSP triggers might be controversial, but I have left them in for completeness.

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- **cleft sentences** (Delin, 1995)
It was Jesus who set me free.
PSP: Somebody set me free.
- **quantifiers** (Cooper, 1983)
I have written to every headmaster in Rochdale.
PSP: There are headmasters in Rochdale.
- **names** (van der Sandt, 1992)
The author is Julius Seidensticker.
PSP: Julius Seidensticker exists.
- **intonation (e.g., focus, contrast)** (Jackendoff, 1972; Geurts and van der Sandt, 2004)
 HE_F set me free.
PSP: Somebody set me free.

The earliest discussions about PSPs centered around the definite article only. As we can gather from the list above, the class of expressions and constructions which are assumed to trigger a PSP has considerably grown since then and they comprise a very heterogeneous bunch of lexical and syntactic items. So for good reasons, there are many theories which argue against treating all PSPs the same (Simons (2001), Abusch (2009), Abrusán (2011) among others, see also the discussion in chapter 3). In this thesis, I take *again* as a starting point, but I will also suggest a classification for PSP triggers on the basis of the semantic properties that the individual triggers have. Parallel to the discussion in the theoretical literature on PSPs, the attention in psycholinguistic experimentation has also centered predominantly around the definite article. There is little to no work in the psycholinguistic realm that investigates the processing of other PSP triggers, especially by the means of online measures such as reading times.¹ This thesis aims at closing this gap. I chose the trigger *again* because it is fundamentally different from the definite article (and other triggers) in a couple of ways. The first way in which it differs from other triggers is that it does not contribute anything to the literal content of the sentence. The sentence in (8-a) asserts that Vera brought cookies yesterday and presupposes that she had done so before. The sentence without

¹There are, of course, a few exceptions which will be presented in the discussion to follow.

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again in (8-b) lacks only the PSP but has the same assertion (that Vera bought cookies yesterday).

- (8) a. Yesterday, Vera brought cookies again.
b. Yesterday, Vera brought cookies.

This is different from a sentence with, for example, *stop*. There is a clear difference between the assertion of (9-a) and (9-b). While the presence of *stop* in the former case brings about the meaning that Simon does not smoke anymore, the latter sentences are understood to assert the opposite.

- (9) a. Simon stopped smoking.
b. Simon smokes / is smoking.

Another way in which *again* differs from other PSP triggers is the way in which it incorporates anaphoricity in its PSP. Soames (1989), Heim (1990), and Kamp and Rossdeutscher (1994) have argued that the PSP of *again* is about a specific time rather than existential. An example taken from Heim (1990) is given below.

- (10) a. We will have pizza on John's birthday, so we shouldn't have pizza again on Mary's birthday.
b. We will have pizza on John's birthday, so we shouldn't have pizza on Mary's birthday.

Only in (10-a), but not in (10-b), do we get the inference that Mary's birthday is after John's birthday. This has to be due to the presence of *again*, because this is the only way in which the two sentences differ. If the PSP introduced by *again* was simply existential, no connection to John's birthday in (10-a) would have to be made. However, since *again* introduces this obvious temporal connection between Mary's and John's birthday, the PSP cannot be merely existential but has to be specific instead. Other triggers like e.g. *know* do not share this property.

This thesis is motivated by the fact that there is so little psycholinguistic research on triggers other than the definite article. The interesting features of *again* make it a good candidate well worth studying. All of the experiments presented in this dissertation were carried out in German. For the research questions I am interested in here, I am assuming that there is no relevant difference between *wieder* and *again*.

1.3.2 Presuppositions as Restrictions on Appropriate Contexts

Stalnaker was the first to model PSPs as conditions on the common ground (Stalnaker, 1973, 1974). According to his definition, the common ground comprises all the assumptions that participants in a conversation share. Formally speaking, the common ground is a set of propositions. By intersecting these propositions, we derive the context set - the set of possible worlds in which everything the discourse participants agree on is true. Asserted statements like (11) update the common ground.

- (11) Nadine supports the soccer club from Bavaria which plays in the Champions League.

By uttering (11) in a conversation, we add the proposition that Nadine supports the soccer club from Bavaria which plays in the Champions League to the common ground. By doing so, we are restricting the context set because all worlds in which Nadine does not support the soccer club from Bavaria which plays in the Champions League are no longer considered to be true. (12) gives a simple formalization of this step, where c is the context set and S is a simple sentence.

$$(12) \quad c+S = c \cap \{w: \llbracket S \rrbracket(w) = 1\}$$

However, for the demonstrated context update to go through, all PSPs of the sentence have to be entailed by the context set. This means that for the example in (11) where the definite article triggers a PSP of uniqueness and existence (Frege, 1892), the following has to hold:

- (13) $c \subseteq \{w: \text{there exists a unique soccer club from Bavaria that plays in the Champions League in } w\}$

If the context is not such that it entails the PSP, PSP failure occurs. Semantically, the sentence is undefined. So imagine a scenario where I utter (11) and you know nothing about German soccer (or international soccer for that matter), the sentence might sound very odd to you.¹ But how does this oddity arise from the fact that a semantic condition like (13) does not hold? This step from semantic undefinedness to inappropriateness in a context is what von Stechow (2003) calls *Stalnaker's Bridge*.

¹The only soccer club from Bavaria playing in the Champions League in 2014 is the FC Bayern München.

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According to this principle, sentences which are semantically undefined in a context, result in pragmatic oddity.

1.3.2.1 Presuppositions as Partial Functions

Throughout this dissertation I will assume a theoretical background very much in the spirit of the one presented above. I will follow Heim and Kratzer (1998) who formalize PSPs in such a way that they make the interpretation function partial. According to this view, the interpretation function is only defined for a Sentence S in a world w, if all of the PSPs of S are true in w. I will also follow Heim and Kratzer's (1998) notation in which the PSP of an expression is written after the colon and before the dot, which is exemplified for the definite determiner *the* in (14).

$$(14) \quad \llbracket \text{the} \rrbracket = \lambda w. \lambda f_{\langle s, \langle e, t \rangle \rangle}: \text{there is exactly one } x \text{ in } w, \text{ s.t. } f(w)(x) \text{ is true. the unique } y, \text{ s.t. } f(w)(y)$$

The combination of a PSP trigger with an argument which does not satisfy the PSP results in undefinedness. The rule for Functional Application (FA), as stated in (2-c) and repeated below, ensures that the whole sentence with the trigger will be undefined as well in this case.

$$(15) \quad \textbf{Functional Application:}$$

If α is a branching node and $\{\beta, \gamma\}$ is the set of α 's daughters, then α is in the domain of $\llbracket \cdot \rrbracket$ if both β and γ are and $\llbracket \gamma \rrbracket$ is in the domain of $\llbracket \beta \rrbracket$. In this case $\llbracket \alpha \rrbracket = \llbracket \beta \rrbracket (\llbracket \gamma \rrbracket)$ (Heim and Kratzer, 1998, pg. 49)

I have argued in the preceding section that *again* is different from other PSP triggers in two distinct ways: 1. it does not contribute anything to the assertion, and 2. it introduces a temporal anaphora. The suggested lexical entry is thus the one in (16) (cited from Beck (2007)).

$$(16) \quad \llbracket \text{again} \rrbracket = \lambda w. \lambda t'. \lambda P_{\langle s, \langle i, t \rangle \rangle}. \lambda t'': t' < t'' \ \& \ P(w)(t'). P(w)(t'')$$

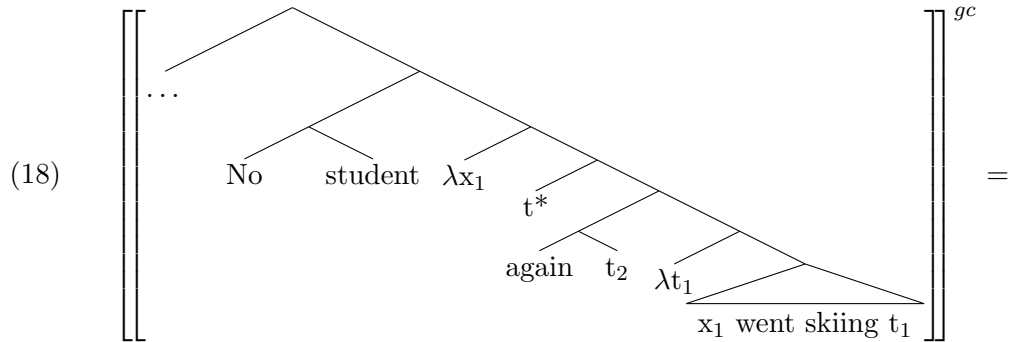
In the compositional derivation of a sentence containing *again*, \mathbf{t}' will be filled by a temporal variable which will end up free in the derivation whereas the temporal variable which fills the slot of \mathbf{t}'' will be bound by a tense operator.

1.3 Theoretical Background on Presuppositions

The analysis of PSPs as partial functions is already able to cover a great portion of the issues connected to PSPs. In the fourth chapter, I will demonstrate how this kind of analysis can also deal with quite intricate phenomena such as PSP projection out of quantified statements. This is a novel thing to do because until now, one of the unsettled debates in the literature on PSPs is how to capture the projection facts that PSPs give rise to. A longstanding debate in the theoretical literature on PSPs is the question which PSP a sentence like (17) carries, where *again* triggers a PSP in the nuclear scope of the quantifier *no*. The two most prominent theories on this issue, which will be discussed in depth in chapter 4, are the ones by Heim (1982) and Beaver (1992). According to Heim's (1982) theory, (17) has a universal PSP, meaning that every student quantified over has been skiing at a time prior to last week. In Beaver's (1992) theory, the PSP comes out as existential, i.e., that there has to be at least one student which has been skiing at a time before last week.

(17) Last week, no student went skiing again.

Intuitive judgments on this matter are very hard to come by and thus controlled experimentation is called for (see chapter 4). What is intuitively clear, however, is that (17) presupposes something. But if we look at a sample calculation of (17) in the textbook framework discussed here, the sentence comes out as presupposing nothing.



$$\begin{aligned}
 & \llbracket \text{No} \rrbracket^{gc} (\llbracket \text{student} \rrbracket^{gc}) (\llbracket \lambda x_1 t^* \text{ again } t_2 \lambda t_1 x_1 \text{ went skiing } t_1 \rrbracket^{gc}) = \\
 & \llbracket \text{No} \rrbracket^{gc} (\llbracket \text{student} \rrbracket^{gc}) (\lambda x_1 \llbracket \text{again} \rrbracket^{gc}(g(2))(\lambda t_1 \llbracket x_1 \text{ went skiing } t_1 \rrbracket^{gc})(t^*)) = \\
 & \llbracket \text{No} \rrbracket^{gc} (\lambda x.x \text{ is a student})(\lambda x_1 \llbracket \text{again} \rrbracket^{gc}(g(2))(\lambda t_1. x_1 \text{ went skiing at } t_1)(t^*)) = \\
 & \llbracket \text{No} \rrbracket^{gc} (\lambda x.x \text{ is a student}) (\lambda x_1. \lambda P_{\langle i,t \rangle}. \lambda t': g(2) < t' \ \& \ P(g(2)). P(t') (\lambda t_1. x_1 \text{ went} \\
 & \text{skiing at } t_1)(t^*)) =
 \end{aligned}$$

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$\llbracket \text{No} \rrbracket^{gc} (\lambda x. x \text{ is a student})(\lambda x_1: g(2) < t^* \ \& \ x_1 \text{ went skiing at } g(2). \ x_1 \text{ went skiing at } t^*) =$
 $\lambda g_{(e,t)}. \lambda f_{(e,t)}. [\{x: g(x)=1\} \cap \{x: f(x)=1\} = \emptyset] (\lambda x. x \text{ is a student})(\lambda x_1: g(2) < t^* \ \& \ x_1$
 $\text{went skiing at } g(2). \ x_1 \text{ went skiing at } t^*) =$
 $\{x: x \text{ is a student}\} \cap \{x: g(2) < t^* \ \& \ x \text{ went skiing at } g(2) \ \& \ x \text{ went skiing at } t^*\} = \emptyset$

In the sample calculation above, (17) comes out as being true if there is no student who went skiing at a time before t^* and at t^* , and false otherwise. There is no PSP that the sentence carries as a whole. However, many scholars agree that such a sentence has at least an existential PSP (cf. Lerner and Zimmermann (1981), Beaver (1992), van der Sandt (1992)). In fact, there is experimental work by Chemla (2009) which suggests that most people even perceive a universal PSP in a sentence like (17). The main problem here is that the quantifier is analyzed as denoting a total function. The same problem arises with other operators which give rise to a certain PSP projection behavior, such as *if*-clauses and conjunction. I will propose a way to remedy this shortcoming in chapter 4. The projection phenomenon gave rise to a new strand of theories, the so-called *dynamic* theories. As I have mentioned above, I will amend the shortcomings of the theory discussed here in the chapters to come. But for the sake of completeness, I will briefly introduce the main theoretical approaches that have been proposed in the dynamic semantics realm in the following section.

1.3.3 Other Theories of PSPs

This section is devoted to three of the most influential theories on PSPs in the linguistic literature (Heim's (1983) *context change potentials*, van der Sandt's (1992) PSPs as anaphora in DRT, and Schlenker's (2008) pragmatic treatment of PSPs). All of these theories were developed in order to account for the projection behavior of PSPs. The first two belong the strand of theories which can be subsumed under the label *dynamic semantic theories*. The third theory represents a recent movement which tries to account for the interpretation of PSPs by pragmatic means. As it turns out, the issues discussed in this dissertation are not dependent on any of these theories and can easily be captured by a partial function approach. This section thus serves as background and can be skipped without affecting the rest of the discussion.

1.3.3.1 Context Change Potentials

The seminal work of Karttunen (1974) and Heim (1983) is often referred to as the *dynamic turn* in the literature on PSPs (Beaver and Geurts, 2011). In what follows I will couch the theory of Heim (1983) in the lambda notation of Heim and Kratzer (1998).¹ We have seen in the discussion above that simple sentences are taken to update the context set. We can thus define a dynamic meaning for a sentence S which is basically a function from context sets to context sets:²

$$(19) \quad \llbracket S \rrbracket_d = \lambda c_{\langle s,t \rangle}. c \cap \llbracket S \rrbracket$$

This is the underlying assumption of Heim’s (1983) *Context Change Potentials* (CCPs). As we can see in (19), simple sentences denote a total function from contexts to contexts. The intuition that a context update is only possible if the context entails all PSPs of a sentence is captured by the fact that a sentence with a PSP is a partial function that is only defined for contexts which satisfy the PSPs of the sentence in question (Heim, 1992, pg. 186). Heim’s theory is dynamic in the sense that context update in complex sentences happens at a sub-sentence level. This is due to the CCP of certain embedding operators. Heim (1983) spells out the CCPs for negation, conjunction, and *if*-clauses. (20) introduces them in lambda notation.³

$$(20) \quad \begin{array}{l} \text{a. } \llbracket \text{not } S \rrbracket_d = \lambda c. c - \llbracket S \rrbracket_d(c) \\ \text{b. } \llbracket S_1 \text{ and } S_2 \rrbracket_d = \lambda c. \llbracket S_2 \rrbracket_d(\llbracket S_1 \rrbracket_d(c)) \\ \text{c. } \llbracket \text{If } A \text{ then } B \rrbracket_d = \lambda c. c - (\llbracket A \rrbracket_d(c) - \llbracket B \rrbracket_d(\llbracket A \rrbracket_d(c))) \end{array}$$

We can gather from (20-a) that c is the argument of S , and has thus to satisfy the PSPs of S . In (20-b), S_1 ’s PSPs are evaluated with respect to c , while the context for S_2 ’s PSPs is the outcome of c being applied to $\llbracket S_1 \rrbracket$. (20-c) makes clear that the PSPs of A have to be entailed by c , whereas the PSPs of B are evaluated with respect of c being applied to A . These are welcoming predictions since they capture the projection facts discussed earlier. Such an analysis can also account for the fact that PSPs seem to disappear sometimes in certain environments. For example, a sentence like (21), does not bear the PSP of the second conjunct, because its local context (c updated with the

¹I would like to thank Sigrid Beck for inspiring this.

²The subscript d indicates that the meaning is dynamic.

³“-” is an operation on two sets, s.t. $p-q$ is the set of worlds in p that are not in q .

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proposition that Jack has children) already entails it. Therefore, the PSP that Jack has children is filtered out by local entailment. (22) gives a somewhat simplified LF for the sentence in (21), and (23) goes through the compositional interpretation.

- (21) Jack has children and all of Jack's children are bald.
- (22) $[\lambda w[\text{Jack has children in } w]]$ and $[\lambda w[\text{all of Jack's children are bald in } w]]$
- (23)
$$\begin{aligned} & \llbracket \text{and} \rrbracket_d ([\lambda w[\text{Jack's children are bald in } w]]) ([\lambda w[\text{Jack has children in } w]]) \\ &= \lambda c. \llbracket [\lambda w[\text{Jack's children are bald in } w]] \rrbracket_d (\llbracket [\lambda w[\text{Jack has children in } w]] \rrbracket_d (c)) \\ &= \lambda c. \llbracket [\lambda w[\text{Jack's children are bald in } w]] \rrbracket_d (c \cap \{w: \text{Jack has children in } w\}) \\ &= \lambda c. [\lambda c'.c' \cap \{w: \text{Jack's children are bald in } w\}] (c \cap \{w: \text{Jack has children in } w\}) \\ &= \lambda c. (c \cap \{w: \text{Jack has children in } w\}) \cap \{w: \text{Jack's children are bald in } w\} \end{aligned}$$

We can gather from the outcome of (23) that the PSP of the consequent which is introduced via the possessive NP is entailed by $c \cap \{w: \text{Jack has children in } w\}$, thus

- (24) $c' \subseteq \{w: \text{Jack has children in } w\}$

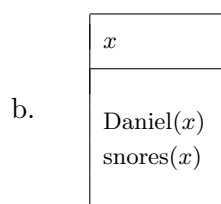
is fulfilled in the local context and does not project as a PSP onto the global discourse context.

1.3.3.2 Presuppositions as Anaphora

Another famous PSP theory has been proposed by van der Sandt and Geurts (1991) and van der Sandt (1992) within a Discourse Representation Theory (DRT, Kamp (1981)) framework. The core idea in DRT is that a discourse representation structure (DRS) is constructed as the discourse unfolds. The DRS makes it possible to keep track of already established information in the discourse, and to relate newly added information to it. DRSs can be represented by a box structure in which the header keeps track of the discourse markers and the main body represents conditions.

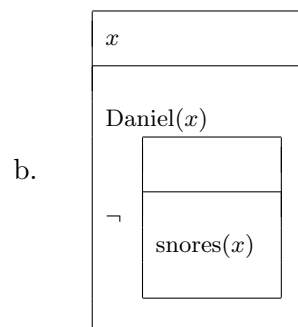
The DRS of a simple sentence like (25-a) is given in (25-b). Negation adds an extra level of embedded structure, as we can see in (26-b).

- (25) a. Daniel snores.



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(26) a. Daniel doesn't snore.



The crucial difference between van der Sandt's (1992) and Heim's (1983) theory is that according to the former, PSPs are anaphora parallel to pronouns, albeit with more descriptive content. Van der Sandt argues that the underlying interpretational mechanisms of (27-a) and (27-b) are essentially the same.

- (27) a. If Jack has children, then all of Jack's children are bald.
 b. If John owns a donkey, he beats it.

In both sentences, the material introduced in the antecedent of the conditional serves as antecedent for the PSP or the pronoun in the consequent respectively. Van der Sandt refers to this process as *PSP binding*. As soon as a PSP gets bound in a given DRS, it does not project any further. Thus, anaphora binding can explain the observed facts about projection.

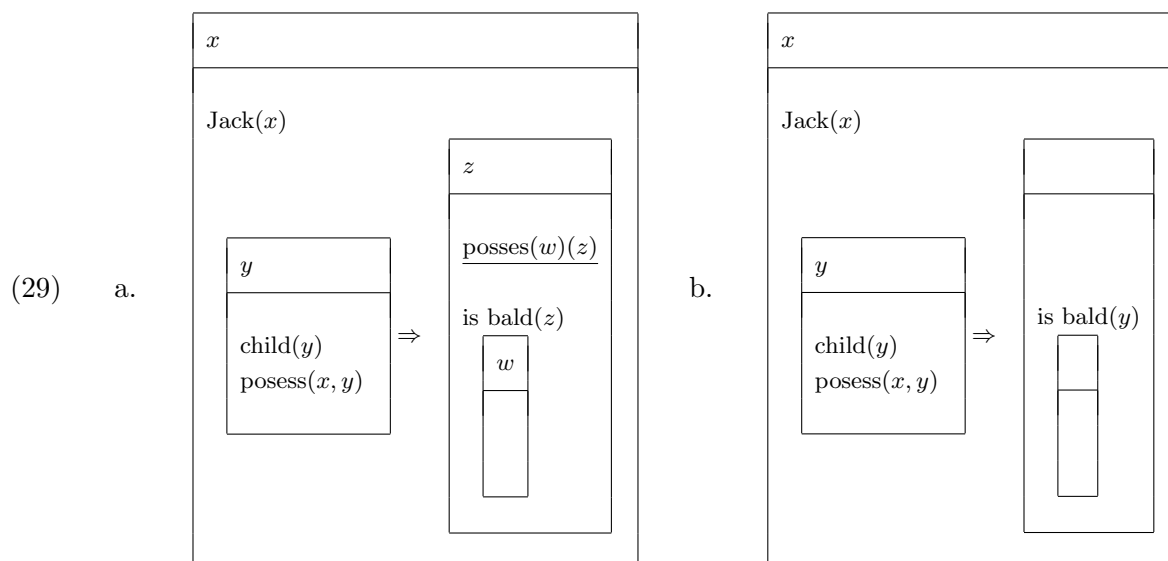
In the following I will go through the somewhat simplified derivation of the DRS for the sentence in (28).¹

(28) If Jack has a child, his child is bald.

The initial representation of (28) is given in (29-a). The PSP that Jack has (at least one) child is triggered in the consequent of the conditional and will be represented as underlined. In the next couple of steps, the pronominal marker w will be equated with the marker x . Since the PSP of the consequent finds a perfect antecedent in the antecedent of the conditional, it will be bound there, resulting in w being equated with x and z being equated with y . Consequently, the PSP triggered in the consequent does not project onto the global DRS and no PSP arises.

¹Since I am only interested in the treatment of PSPs, I will omit variable such as times and worlds when they are not crucial for the derivation.

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If the antecedent of the conditional does not furnish a good antecedent for the PSP to be bound by as in (30), the PSP percolates further up the structure, resulting in a global PSP. PSP resolution is thus a **bottom up** process.

(30) If Jack made breakfast, his child is bald.

If the PSP reaches the global DRS, that is if it does not find an appropriate antecedent during derivation, it has to be accommodated there. If, however, world knowledge or binding constraints prohibit accommodation at this level, the PSP will be accommodated at the next lower level. Accommodation is hence a **top down** process which follows PSP resolution.

1.3.3.3 Presuppositions as Pragmatic Phenomena

In recent years, an abundance of work which derives properties of PSPs on the basis of pragmatic reasoning has evolved (see Abrusán (2011), Abusch (2002), Simons (2001), Schlenker (2008, 2009), among others). These theories do not view PSPs as definedness conditions but attribute their behavior and the oddness in case of their failure to (the violation of) pragmatic principles. Here I will mainly focus on Schlenker's (2008) *Transparency Theory*, since this theory makes the broadest claims about PSPs

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in general. The main focus of Abrusán (2011) and Simons (2001) is the differences between individual triggers. I will thus discuss these theories in the third chapter, where I present an experiment which investigates the processing of sentences with different PSP triggers.

In Schlenker’s theory, PSPs are part of a bivalent meaning of propositions and predicates, i.e., a sentence like (31) has the meaning in (32).

(31) John knows that it is raining.

(32) It is raining and John knows that it is raining.

According to Schlenker, the unpronounced meaning, the PSP, is a ‘pre-condition’ of the whole bivalent meaning in (32). (Schlenker, 2008, p. 9) stipulates the pragmatic principle *Be Articulate* in (33), where, $\underline{d}d$ ’ is the meaning of the presuppositional phrase with \underline{d} being the pre-condition and d ’ the main assertion (in the example above: \underline{d} = It is raining, d ’ = John believes that it is raining).

(33) *Be Articulate*:

In any syntactic environment, express the meaning of an expression $\underline{d}d$ as (d and $\underline{d}d$)

(... unless independent pragmatic principles rule out the full conjunction.)

What *Be Articulate!* essentially says is that a PSP should always be expressed overtly if there are no independent pragmatic principles that would make it odd to do so.

Schlenker remains silent as to how exactly the bivalent meaning of a presuppositional phrase comes about, but it is tempting to root its origin in the PSP trigger. (34) gives what could be an example of a Schlenkerian entry for *know*.¹

(34) $\llbracket \text{know} \rrbracket_{\text{Schlenker}} = \lambda w. \lambda p. \lambda x. \underline{p(w) = 1} \ \& \ x \text{ believes } p \text{ in } w$

It is important to note that in this case the meaning of a PSP trigger, and consequently the whole sentence, is always a total function. This means that the oddness of a PSP not given in the context can no longer be explained by semantic undefinedness. Instead, Schlenker argues that the oddity in the case of PSP failure is due to the violation of *Be*

¹The underlined part is not a definedness condition in the sense of Heim and Kratzer (1998), but what Schlenker calls a ‘pre-condition’.

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Articulate. Next, consider the sentences in (35) where (35-a) is the articulated version of (35-b).

- (35) a. It is raining and it is raining and John knows that it is raining.
b. It is raining and John knows that it is raining.

Even though (35-a) adheres to the principle *Be Articulate*, it is more degraded than (35-b). So, according to *Be Articulate*, there has to be an independent pragmatic principle that rules out (35-a). For Schlenker, this is Grice's (1975) maxim of manner *Be Brief*. Schlenker (2008) notes that the interplay of *Be Brief* and *Be Articulate* could be implemented in a optimality theoretic framework where *Be Brief* would be ranked higher than *Be Articulate*, i.e., if the PSP of a sentence is already in the common ground, *Be Brief* should always be adhered to.

In his paper, Schlenker (2008) argues for two versions of *Be Brief* - an incremental and a symmetric version. The details should not worry us at this point.¹ For the moment, I will only consider the version of *Be Brief* given in (36), see Schlenker (2008, p. 11).

(36) ***Be Brief* - Incremental Version**

Given a context set C , a predicative or propositional occurrence of d is infelicitous in a sentence that begins with α (*d and* if for any expression γ of the same type as d and for any good final β , $C \models \alpha (d \text{ and } \gamma) \beta \Leftrightarrow \alpha\gamma\beta$).

What (36) basically says is that a sentence is infelicitous in a context if the PSP of an expression is expressed overtly and either the context or the preceding material in the sentence entail it. In these cases, *Be Articulate* does not apply. This set of rules also accounts for the asymmetry in (37).

- (37) a. If baldness is hereditary, then all of Jack's children are bald.
PSP: Jack has children
b. If all of Jack's children are bald, then baldness is hereditary.
PSP: Jack has children

¹Schlenker postulates that the violation of the incremental version leads to a greater oddity than when only the symmetric version (which is somewhat more liberal than the incremental version) is violated.

- (38) a. If Jack has children, then all of Jack's children are bald.
PSP: none
- b. If all of Jack's children are bald, then Jack has children.
PSP: Jack has children

Since the version of *Be Brief* in (36) is incremental, the consequent of a conditional is always interpreted with respect to the context and the antecedent. In (38-a), the PSP of the consequent is entailed by the antecedent and therefore the sentence does not violate *Be Brief* and *Be Articulate*. For the other three examples, however, the antecedent is not such that it entails the PSP of the consequent. Therefore, according to (36), either the context entails that Jack has children, or else these examples are a violation of *Be Articulate* and will thus result in a degraded sentence. PSPs according to this theory are pre-conditions of a bivalent meaning which have to be met either by the (global discourse) context or by the preceding material in a sentence.¹ Crucially, contrary to the common ground theories, if this pre-condition is not met by either, the whole sentence does not end up as undefined but rather as inappropriate due to the violation of conversational maxims.

1.4 Presuppositions in Processing

There is already an abundant amount of work on the processing of definite NPs in the psycholinguistic literature, but a lot less on other PSP triggers. In this section I will give a brief overview on some of the experiments on PSPs using online measures, such as reading times for example. The focus on online measures is chosen deliberately because all the experiments presented in this thesis are concerned with the time course of PSP interpretation. In recent years, PSPs have moved into the center of attention in the psycholinguistic literature. This has led to the emergence of a number of very interesting offline studies on intricate issues surrounding PSPs like projection out of negation (Chemla and Bott, 2012), conditionals (Chemla and Schlenker, 2009; Romoli et al., 2011) and quantified expressions (Chemla, 2009). The experiment presented in Chemla (2009) will be discussed in depth in the fourth chapter which looks at the projection behavior of PSPs triggered in the scope of a quantifier. But let us turn to

¹This idea is fleshed out in the form of *local contexts* in Schlenker (2009).

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the results obtained from online experiments first.¹ These are especially relevant for my work, because they give us a first idea of the timing of PSP processing. It will become clear from the discussion that PSPs are a phenomenon that has an influence in online processing. But it will also become apparent that most of the psycholinguistic work on PSPs so far has predominantly focused on the definite determiner. Moreover, I also want to show that there are still some issues concerning PSPs which have not yet received enough attention in the processing literature, such as the exact timing of PSP processing and the question whether and which PSPs are accommodated. These are all topics that this dissertation will address.

In one of the first experiments which are relevant to the issue of PSP processing, Altmann and Steedman (1988) investigated in a self-paced reading fashion how sentences with a definite determiner are processed when the uniqueness PSP is not met. Even though their actual goal was to test Frazier's (1978) *Minimal Attachment Hypothesis*, their results turn out to be very relevant for a theory of PSP processing. In their experiment, they had subjects read sentences along the lines of either (40-a) or (40-b).² They presented these test sentences in two different contexts. One which introduced two safes (39-a), and another one in which only one relevant safe was mentioned (39-b). By having the PP *with the new lock* modifying *the safe* in (40-a), the uniqueness PSP is met even when the sentence is presented in a context like (39-a), whereas this is not the case for a sentence like (40-b).

- (39) a. A burglar broke into a bank carrying some dynamite. He planned to blow open a safe. Once inside he saw that there was a safe with a new lock and a safe with an old lock.
- b. A burglar broke into a bank carrying some dynamite. He planned to blow open a safe. Once inside he saw that there was a safe with a new lock and a strongbox with an old lock.
- (40) a. The burglar / blew open / the safe / with the new lock / and made off / with the loot.

¹Throughout this dissertation I am using *online* in order to refer to experiments that investigate the processing during sentence interpretation such as reading times. The collection of reaction times, acceptability judgments and questionnaires will be considered *offline* methods.

²Slashes indicate the strings of words that were presented together at the same time.

- b. The burglar / blew open / the safe / with the dynamite / and made off / with the loot.

The results of this experiment reveal that reading times came apart on the disambiguating region (i.e. the PP *with the new lock* or *with the dynamite*). Test sentence (40-b) was read more slowly in the context which introduced two safes than all the other conditions. Moreover there was no difference in reading times for (40-a) in either (39-a) or (39-b). There was, however, a difference between (40-a) and (40-b) when presented in a context like (39-a) with (40-b) being read more slowly. This shows that when the uniqueness PSP of the definite determiner is not met, people experience processing difficulties quite early, i.e., before the end of the sentence. However, the results of this experiment also suggest that comprehenders do not detect an unmet PSP immediately (on the NP). It seems that the processor rather delays the evaluation of the PSP until later. In this experiment, such a strategy turned out to be especially useful since the constituent following the NP made it obvious whether the PSP was met or not. If comprehenders were to check the PSP right away, one would expect an increase in reading times on the NP already. Moreover, one would expect these inflated reading times for both test sentences when presented in a context such as (39-a). Since there were no effects of that sort, it seems that processors delayed the decision of whether the PSP of the definite article is met or not met to a later, disambiguating region of the sentence.

In relation to this, the event related potential (ERP) studies in van Berkum et al. (1999) and van Berkum et al. (2003) are relevant. In an experiment with spoken sentences, van Berkum et al. (2003) replicated the findings obtained from a written language experiment presented in van Berkum et al. (1999). In both experiments, definite NPs evoked early ERP effects when the uniqueness PSP was not met. Their material comprised discourses like (41) and (42). In (41), the uniqueness of the NP **the girl** in the last sentence is verified because there is only one girl salient in the context. In (42) on the other hand, there are two girls introduced in the context which are both equally salient and hence the uniqueness PSP of the definite determiner is violated until the relative clause *that had been on the phone* disambiguates the sentence.

- (41) David had told the boy and the girl to clean up their room before lunchtime. But the boy had stayed in bed all morning and the girl had been on the phone all the time. David told **the girl** that had been on the phone to hang up.

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- (42) David had told the two girls to clean up their room before lunchtime. But one of the girls had stayed in bed all morning and the other girl had been on the phone all the time. David told **the girl** that had been on the phone to hang up.

The ERP results show that there is an early negative deflection on the critical noun (*girl*) in (42) when compared to (41). This deflection occurs about 300-400 ms after the acoustic onset of the noun. van Berkum et al. (2003) take this to suggest that “referential ambiguity” is detected very early during sentence comprehension. This can also be interpreted as saying that the unmet PSP of the definite determiner leads to early effects in ERPs. What is crucial here is that even though the test items were such that there was a disambiguating relative clause after the NP, initial processing of the PSP was not delayed until this part of the sentence had been heard/read. In other words, interpreters checked the PSP in the context as early as hearing/reading the noun and encountered a problem when it was not given even though they knew that the following discourse could in principle still save the sentence from PSP failure. This is an interesting result because it contrasts with the result found in Altmann and Steedman (1988) in the way that the ERP data suggests that the PSP of *the* is checked as soon as possible regardless of what might follow afterwards. Without knowing how exactly the filler items in the three experiments looked like, it is hard to judge how these different effects came about. It may well be that in the study of Altmann and Steedman (1988), subjects developed a processing strategy in which they always waited for the disambiguating PP before caring about the PSP, while they did not do so in van Berkum et al. (1999) and van Berkum et al. (2003). The difference in the timing of the observed effect could also be due to the fact that we are looking at two different measures. Whatever the exact reasons for this difference in timing are, at this point it is sufficient to acknowledge that the electrophysiological experiment clearly shows that people realize the PSP of a definite NP may be unmet at the earliest point possible, even though it might still be amended later on in the sentence.

Another ERP study which gives interesting insights into the processing of the PSP of the definite determiner is found in Burkhardt (2006). This paper reports an experiment in which a target sentence with a definite NP like (44) was presented in three different contexts. The *given* context in (43-a) explicitly introduces the individual which the

definite NP refers to. The other two context do not explicitly verify the existence PSP of the definite, but it can be inferred in the *bridged* (cf. Clark (1974)) condition (43-b), whereas this is not possible in the *new* condition in (43-c).

- (43) a. Tobias visited a conductor in Berlin.
b. Tobias visited a concert in Berlin.
c. Tobias talked to Nina.

- (44) He said that the conductor was very impressive.

The results show an early negative deflection 400 ms after the noun onset in the new condition (N400). This effect was less pronounced in the bridged condition. This shows that when the existence PSP of the definite determiner is not given, an N400 emerges, parallel to what van Berkum et al. (2003) found for sentences where the uniqueness PSP was violated. This effect is not as strong when the relevant individual can be easily inferred from the context. Most importantly however, Burkhardt (2006) found a late positive effect (P600) in the new and in the bridged condition when compared to the given condition. The author concludes that this “suggests that the respective discourse units are fully integrated at this point, indicating that an independent discourse referent is identified to be stored and maintained in discourse representation” (Burkhardt, 2006, p. 166). In the words of a PSP theory, the late positive deflection might be taken to signify accommodation.

The other PSP triggers which have been studied by the means of online methods are German *auch* ('too'), English *also*, *wieder* ('again'), *aufhören* ('stop'), and factives such as *know*.

In a reading experiment using self-paced reading, Schwarz (2007) investigated the processing of German *auch* ('too') and English *also*. Since the results are roughly the same for both languages, I will for the ease of presentation discuss only the experiment conducted in English here. In this experiment, subjects were asked to read sentence along the lines of (45).

- (45) a. The congressman/ who wrote to John/ had also written to the mayor/ to schedule a meeting/ for the fundraiser.
b. The congressman/ who wrote to John/ had just written to the mayor/ to schedule a meeting/ for the fundraiser.

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- c. The congressman/ who John wrote to/ had also written to the mayor/ to schedule a meeting/ for the fundraiser.
- d. The congressman/ who John wrote to/ had just written to the mayor/ to schedule a meeting/ for the fundraiser.

The sentences were constructed in such a way that the PSP of *also* (that there is another $x \neq$ the mayor, such that the congressman wrote to x) is given in (45-a), but not in (45-c). The sentences in (45-b) and (45-d) do not trigger the relevant PSP and were thus used as controls. The results show that a sentence like (45-a) was read faster than a sentence like (45-c) on the region containing *also*. This can again be seen as evidence for an early PSP processing since the mode of presentation in this experiment was such that the string of words that *also* was presented with already made the PSP evident. However, it fails to track the exact point in time at which PSP processing takes place.

A similar point applies to Inhoff's (1985) eye-tracking study. The author had subjects read a text in which some of the sentences were such that a non-factive (a) / factive (b) verb embedded a false (according to world knowledge) clause. An example is given below.

- (46) ... Today was an arithmetic test. The teacher asked little Tom. He {(a) said / (b) knew} that two and two equalled three. ...

On the false complement, there was a significant difference in first gaze durations where the complement was read more slowly when presented after a factive verb (b) than after a non-factive verb (a). Inhoff (1985) concludes that "the finding that lexical presuppositions affected the interpretation of the false complement suggests that reader's sentence interpretation was based not only on their empirical and analytical knowledge but also on their linguistic knowledge". The interesting finding is here that people did not experience processing difficulties on the false complement per se, but only when it was embedded under a verb which presupposes its complement to be true. This is just one more experiment which shows that PSPs play an important role in sentence understanding. However, the critical region looked at was so large (the whole complement), that we cannot determine precisely at which point the PSP started to have an effect on people's reading times.

The only online study that comprises a variety of different PSP triggers is presented in Tiemann et al. (2011). The authors report three self-paced reading studies and acceptability ratings concerning the processing of PSPs introduced by the triggers *wieder* ('again'), *auch* ('also'), *aufhören* ('stop'), *wissen* ('know'), and definites in the shape of possessive noun phrases. The first experiment compares a sentence with a PSP trigger (47-b-i) to a grammatical sentence without a PSP trigger (47-b-ii), and an ungrammatical sentence (47-b-iii). Each sentence was presented after the same context sentence (47-a) which was neutral with respect to the PSP of the sentence which contained a PSP trigger.

- (47) a. Tina ist mit einer guten Freundin shoppen.
Tina is with a good friend shopping
'Tina is shopping with a good friend.'
- b. (i) Sie kauft wieder rote Handschuhe.
She buys again red gloves
'She buys red gloves again.'
- (ii) Sie kauft heute rote Handschuhe.
She buys today red gloves
She buys red gloves today
- (iii) *Sie kauft freundlich rote Handschuhe.
She buys friendly red gloves
'She buys red gloves friendly.'

Their results reveal that a sentence with a PSP which is not provided by the context is rated significantly worse than a sentence without a PSP trigger and significantly better than an ungrammatical sentence. The interesting finding concerning the reading times is that on the word after the trigger (here: *red*), the reading times in the PSP condition were longer than in the grammatical condition but faster than in the ungrammatical condition. By the end of the sentence, however, the reading times in the PSP condition were significantly longer than in the grammatical condition and marginally longer than in the ungrammatical condition. Tiemann et al. conclude that the persistent significant difference between the PSP and the grammatical condition after the trigger in comparison to the short increase and quick decrease of reading times in the ungrammatical condition shows that the reader tries to accommodate the content of the PSP in the PSP condition which demands more processing effort than rejecting an ungrammatical sentence.

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The second experiment comprises the comparison of a sentence with a PSP when the PSP is verified in the context versus when it is explicitly falsified. Each context sentence ((48-a-i), (48-a-ii)) was paired with two test sentences ((48-b-i), (48-b-ii)) in such a way that the content of the test sentence's PSP was verified ((48-a-i)/(48-b-i), (48-a-ii)/(48-b-ii)) or falsified ((48-a-i)/(48-b-ii), (48-a-ii)/(48-b-i)) by the context. If the content of the PSP of a test sentence was verified by one context sentence, it was falsified by the other context sentence and vice versa.

- (48) a. (i) Susanne hat dieses Jahr bereits rote Handschuhe gekauft.
Susanne had this year already red gloves bought
'Susanne had already bought red gloves this year.'
- (ii) Susanne hat bisher nie rote Handschuhe gekauft.
Susanne has until now never red gloves bought
'Susanne had never bought red gloves until now.'
- b. (i) Heute hat Susanne wieder rote Handschuhe gekauft und sie
Today has Susanne again red gloves bought and them
gleich angezogen.
immediately put on
'Today, Susanne bought red gloves again and put them on right
away.'
- (ii) Heute hat Susanne wieder keine roten Handschuhe gekauft und
Today has Susanne again no red gloves bought and
ärgert sich.
is upset self
'Today, Susanne didnt buy red gloves again and is very upset.'

The reading times in the two conditions (PSP verifying context and PSP falsifying context) came apart as soon as the content of the PSP was known (here: *bought*). At this point, reading times in the falsifying condition were significantly longer than in the verifying condition, suggesting that the PSP is evaluated with respect to the context immediately.

In the last experiment, Tiemann et al. (2011) contrasted the processing of a sentence that carries a PSP (49-b) in three different context conditions: in a context that verifies the PSP of the sentence (49-a-i), a context that falsifies the PSP (49-a-i) and a context which is neutral with respect to the PSP (49-a-ii).¹

¹This experiment will be discussed in the third chapter. In contrast to Tiemann et al. (2011), the

- (49) a. (i) Susanne hat dieses Jahr bereits rote Handschuhe gekauft.
 Susanne has this year already red gloves bought
 ‘Susanne has already bought red gloves this year.’
- (ii) Susanne hat bisher nie rote Handschuhe gekauft.
 Susanne has until now never red gloves bought
 ‘Susanne has never bought red gloves until now.’
- (iii) Inge hat bisher nie rote Handschuhe gekauft.
 Inge has until now never red gloves bought
 ‘Inge has never bought red gloves until now.’
- b. Heute hat Susanne wieder rote Handschuhe gekauft und sie
 Today has Susanne again red gloves bought and them
 gleich angezogen.
 immediately put on
 ‘Today, Susanne bought red gloves again and put them on right away.’

Averaging over the five different PSP triggers (*wieder* (‘again’), *auch* (‘also’), *aufhören* (‘stop’), *wissen* (‘know’), and possessive noun phrases), there was a significant difference in reading times between the three conditions on the PSP trigger, and the whole sentence, with longer reading times in the neutral context condition compared to the falsifying context condition. Additionally, there was a marginally significant effect on the word on which the content of the PSP is known (here: *bought*) with reading times of the sentence in the neutral context condition being longer than in the other two conditions. The authors argue that the result that sentences carrying a PSP in a neutral context took longer to read on the critical word than the same sentence within a context which explicitly falsifies or verifies the content of the PSP, suggests that there is an extra processing load which could reflect accommodation. One drawback is that the reading times results of all experiments presented in Tiemann et al. (2011) averaged over all five triggers used. This does not allow for a comparison between different PSP triggers. In the third chapter I will therefore take a closer look at the results for the individual triggers in turn.

These experiments tell us a lot about the processing of PSPs and the definite determiner in particular. First, that effects connected to PSPs do arise with a wide variety of modalities (behavioral and physiological). Second, early deflections in ERPs indicate that the focus will be on the results of the individual triggers, however.

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cate that PSPs (at least the ones of the definite determiner) are computed as soon as possible.

However, it would be premature to conclude from these experiments that all PSP triggers are processed in the same way. I have already discussed that there are substantial theoretical differences between a trigger like *again* on the one hand and other triggers on the other hand. Another issue which is not really answered by the experiments presented here is when the PSP of a trigger other than the definite is processed. Those studies that investigated other triggers were set up in such a way that it is not possible to pinpoint the exact time course of PSP processing, either because the regions analyzed were too large (Schwarz, 2007; Inhoff, 1985) or because reading times of different triggers were aggregated (Tiemann et al., 2011). Additionally, it is not clear what happens when a PSP is not given in the context. While Schwarz (2007) concludes that his results show that the PSP of *also* is not accommodated, Tiemann et al. (2011) suggest that the effects obtained in their experiment reflect accommodation.

1.5 Outlook

The focus of this dissertation is on three experiments that I carried out to investigate the processing of German *wieder* ('again') and other PSP triggers (especially in chapter 3). The first experiment, presented in chapter 2, has the goal of getting a better understanding of how *wieder* is processed in simple sentences in different contexts. To this end, sentences containing *wieder* are presented in contexts which explicitly satisfy the PSP of *again* and in contexts which fail to do so. As far as reading times are concerned, the main focus is on answering the question at which point during sentence reading, processing difficulties arise due to a PSP which is not given in the context. Additionally, comprehension questions are asked to determine whether subjects accommodate the PSP introduced by *wieder* in these contexts. It will be shown that the results obtained in this experiment allow for the formation of new hypotheses that have direct consequences for processing predictions for PSP triggers other than *wieder*.

These predictions are tested in the experiment presented in the third chapter of this thesis. On the basis of the results of the first experiment, I lay out processing predictions made by a strictly semantic theory. These are contrasted with predictions that can be drawn from more pragmatic theories like Simons (2001), Abusch (2009), or

Abrusán (2011). To test these predictions, sentences with a variety of triggers (*again*, *too*, *know*, *stop*, definite determiner) will be presented in contexts which verify their PSPs, contexts which falsify them, and contexts which do not say anything about the presupposed information. The results reveal that a semantic theory of PSPs as presented in chapter 2 is best fit to account for the observed reading time pattern for each individual trigger. Other interesting issues that I address are the difference between temporal and individual variables in processing, accommodation in processing, and the difference between different kinds of interpreters.

In the third and final experiment, presented in chapter 4, I turn to the issue of PSP projection out of quantified statements. Specifically, I investigate the processing of universally and existentially quantified sentences with *again* and the definite determiner. In this chapter, I discuss two theories of PSP projection (Heim, 1983; Beaver, 1992) and the processing hypotheses that we can draw from them. The results of the conducted eye-tracking experiment suggest that neither theory is on the right track. I thus argue for a theory which takes the contribution of the quantifier into account.

In the final chapter 5, I summarize the main findings of this thesis and discuss what they contribute to (a) a theory of PSPs and (b) the construction of a semantic processing model. I conclude with open questions and interesting issues for future work.

1. INTRODUCTION

2

Focusing on *wieder*: To accommodate or not to accommodate?

2.1 Introduction

The first chapter provided us with the theoretical background for PSPs. We have seen that, according to a theory which analyzes PSPs as restrictions on appropriate contexts, the context set has to entail all the PSPs of a sentence in order for the sentence to get a truth value. The context set is the set which contains all “possible worlds where all the propositions that are the background assumptions of speakers are true” (Stalnaker, 1973, p. 450). What that means for a sentence like (1-a) is that the context set has to consist only of those worlds in which Susanne went skiing some time before last weekend. A semi-formal representation is given in (1-b) which states that the context set c has to be a set of worlds in which Susan went skiing at prior to last weekend.

- (1) a. Last weekend, Susan went skiing again.
b. $c \Rightarrow \lambda w. \exists t [t < \textit{last weekend} \ \& \ \textit{skiing}(\textit{Susanne})(w)(t)]$

If the context is not such that it provides the relevant PSP, there are only two ways out: Either, the hearer of a sentence like (1-a) accommodates the relevant PSP, i.e., s/he adjusts the context set in such a way that it only contains the worlds in which the PSP is true, or s/he decides that the relevant piece of background information is missing and

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thus the whole sentence cannot receive a well defined interpretation. However, in the case of *wieder*, the matter is even more complicated than that. Recall that it has been argued by Soames (1982), Heim (1990), and Kamp and Rossdeutscher (1994) among others that the temporal variable in the PSP of *wieder* is not existentially bound but receives its value from the context. Consequently, (1-b) has to look like (2).

$$(2) \quad c \Rightarrow \lambda w.t < \textit{last weekend} \ \& \ \textit{skiing}(\textit{Susanne})(w)(t)$$

So from a theoretical perspective, there are two issues that have to be looked at when it comes to the processing of *wieder*: 1. How and when is the PSP of *wieder* checked in a given context, and 2. How is the free time variable processed. The first question relates to the processing of PSPs in general. The second question, however, is interesting from a wider perspective of sentence interpretation. For decades, psycholinguists have been concerned with how bound and free variables are processed. Recent research (e.g. Frazier and Clifton (2000); Koornneef (2008)) has shown there is a processing advantage for bound over free variables. The issue at hand is even more interesting since previous research on the processing of variables has almost exclusively focused on individual variables. To date there is only very little work on the processing of time variables. In fact, Dickey (2000) seems to be the only one who makes a serious effort to combine semantic theories of tense and processing. Moreover, to my knowledge, there is no one out there who has looked at the processing of variables which are introduced at the level of PSP.

The experiment presented in this chapter will look at the two issues of PSP verification and variable assignment. Concerning the former, the focus is on what happens when the PSP of *wieder* is given versus when it is not given in a certain context. When is the missing PSP recognized by the processor? What happens when it is recognized? Does accommodation of the missing PSP apply or does the processor give up on the sentence completely? Are there alternative routes? As it will turn out, the answers to these questions are intimately connected to the second issue of assigning a value to the free time variable. Does variable assignment interfere with PSP verification? When does the free variable receive its value during online processing?

The chapter is organized as follows: First, I am going to present a self-paced reading and question study which investigates the processing and interpretation of *wieder* ('again') in contexts which satisfy the PSP and contexts which do not. Second, I will

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discuss the results obtained and propose a new maxim of interpretation named *Minimize Accommodation*, and discuss its consequences for triggers other than *again*. The final section concludes the chapter.

2.2 Experiment: *wieder* in Positive and Neutral Contexts

The experiment presented in this section aims to address the questions laid out above. The two central questions are: 1. How is the PSP of *wieder* processed?, and 2. What is the exact time course of this process? An additional issue which will be looked at in this experiment is the notion of accommodation. Most theories of PSPs assume that in case of PSP failure, a sentence will either be undefined or the relevant PSP will be accommodated. Since it has been argued for triggers like *again* and *too* (cf. Kripke (2009); Beaver and Zeevat (2008)) that their respective PSPs are especially hard to accommodate, it is specifically interesting to test experimentally how people deal with a sentence containing *again* in a context which does not support its PSP.

To this end, I set up an experiment using self-paced reading (SPR) with questions targeting the PSP of *again*. As we have seen in Schwarz's (2007) experiments on *auch* and *also*, SPR is sensitive enough to capture PSP related effects. The present study extends on Schwarz's (2007) experiments in that it presents target sentences in a word by word fashion. This ensures that effects due to the PSP will emerge as soon as they arise during sentence processing.

2.2.1 Method and Materials

The basic idea was to present a target sentence with one of two context sentences which differed as minimally as possible. In order to do this, we created 40 items along the lines presented below, where the PSP of (3-b)-a is given in (3-a-ii) (positive context), but not in (3-a-i) (neutral context), and the PSP of (3-b)-b is given in (3-a-i) (positive context), but not in (3-a-ii) (neutral context). In order to prevent anticipation, we additionally constructed target sentences where the subject of the target sentence was not the beneficiary but the agent.

2. FOCUSING ON *WIEDER*: TO ACCOMMODATE OR NOT TO ACCOMMODATE?

- (3) a. (i) Letzte Woche hat Linda Judith eine rosa Lampe für ein Zimmer
last week has Linda Judith a pink lamp for a room
gekauft.
bought
Last week, Linda bought Judith a pink lamp for a room.
- (ii) Letzte Woche hat Judith Linda eine rosa Lampe für ein Zimmer
last week has Judith Linda a pink lamp for a room
gekauft.
bought
Last week, Judith bought Linda a pink lamp for a room.
- b. Vor zwei Tagen hat {(a) Linda / (b) Judith} wieder eine rosa Lampe
ago two days has {(a) Linda / (b) Judith} again a pink lamp
erhalten, als sie mit einer Freundin unterwegs war.
received, when she with a friend out was
Two days ago, {(a) Linda / (b) Judith} received a pink lamp again, when
she was out with a friend.

Apart from the 40 experimental items, we created 40 filler items in order to mask the purpose of the experiment. The filler items were constructed in a fashion parallel to the experimental items. Crucially, they did not contain the PSP trigger *wieder*. After each (experimental and filler) sentence we asked multiple-choice comprehension questions with three possible answers to choose from. For one third of the experimental items, the question targeted the content of the PSP directly. An example of such a question is (4-a) with the possible answers in (4-b).

- (4) a. Wie viele rosa Lampen hat {Linda/Judith} bekommen?
How many pink lamps has {Linda/Judith} received
'How many pink lamps did {Linda/Judith} receive?'
- b. Kann man nicht beantworten / eine / mindestens zwei
Can one not answer / one / at least two
Cannot be answered / one / at least two

In those cases where the question did not target the presuppositional content of the sentence, they addressed information introduced either by the context sentence or the test sentence, like the one in (5) on the next page.

2.2 Experiment: *wieder* in Positive and Neutral Contexts

- (5) a. Mit wem war {Linda/Judith} unterwegs?
With who was {Linda/Judith} out
'Who was {Linda/Judith} out with?'
- b. Kann man nicht beantworten / einer Freundin / ihrem Vater
'Can one not answer / a friend / her father
Cannot be answered / a friend / her father

We included the option *cannot be answered* to explore the possibility that an unaccommodated PSP leads to the uninterpretability of the sentence it occurs in. In order not to make it a viable answer only in the questions concerning the PSP, *cannot be answered* was always one of the three possible answers displayed. Therefore, we also included questions that really could not be answered on the basis of the information given in the context and the target sentence.

The experiment was programmed using the ERTS language. The experiment was divided into eight randomized lists. All participants came in two times. Each time they were given four of the eight randomized lists. The order of the eight lists was counterbalanced across participants. A global context was provided in the beginning of the experiment in order to introduce the relevant characters. Responses were collected via an external keyboard consisting of six separate keys.

A trial began with the presentation of a warning signal that consisted of five stars. Then the context sentence was presented. A self-paced reading paradigm was used for the critical target sentence that followed. Participants were presented the sentence word by word. Reading times were collected by having the reader press a response key after each word. The end of a sentence was signaled by a full stop. After that, participants had to rate the acceptability of the test sentence with respect to the context sentence on a four item rating scale (1= very bad 2= rather bad 3= rather good 4=very good). Participants were given an even number of points on the scale to choose between in order to guarantee that they had to express a tendency towards acceptability or unacceptability. They delivered their judgment by pressing a corresponding button. After the end of each trial, the comprehension question was asked.

16 subjects participated in the experiment. Most of them were students at the University of Tübingen (13 women; mean age = 24,38; age range = 18-37). They were native speakers of German and had normal or corrected to normal vision.

2. FOCUSING ON *WIEDER*: TO ACCOMMODATE OR NOT TO ACCOMMODATE?

2.2.2 Predictions

On the basis of the experiments presented in the first chapter, there are a couple of predictions that can be made about the present experiment. Concerning the acceptability ratings, it is very likely that sentences in the positive condition will be rated higher than sentences in the neutral condition (cf. Tiemann et al. (2011)).

As for reading times, the results in Tiemann et al. (2011) suggest that PSPs are processed as soon as the content of the PSP is fully known. That is, on the critical word (*erhalten* in the example in (3-b)) reading times in the neutral and in the positive condition should come apart. Moreover, Tiemann et al. (2011) have argued that accommodation is a costly process which is reflected in persistently long reading times. Hence, if the PSP of *wieder* is accommodated, reading times could exhibit a pattern like the one presented in Figure 2.1.

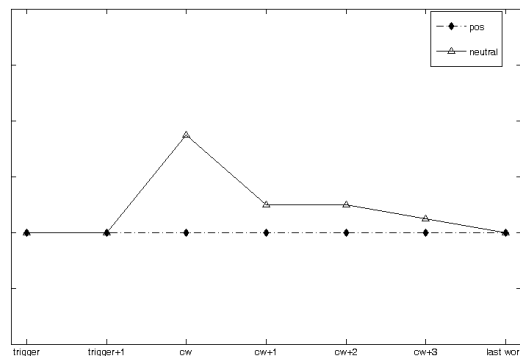


Figure 2.1: Processing Prediction for Simple sentences containing *wieder* -
Neutral condition receives longer reading times on the critical word and thereafter

The questions targeting the PSP content are designed in such a way that they will help us to understand whether the PSP of *wieder* is indeed accommodated. If this is the case, the prevalent answer for sentences presented in the neutral condition should be *at least two*. Alternatively, there is also the chance that people do not accommodate the PSP of *wieder* since its PSP has been argued to be harder to accommodate than the PSP introduced by other triggers (e.g. Kripke (2009); Beaver and Zeevat (2008)). In a framework that analyzes PSPs as introducing partial functions, PSP failure results in an undefined sentence. Hence, the answer most chosen in the neutral condition could

2.2 Experiment: *wieder* in Positive and Neutral Contexts

also be *cannot be answered*. The present experiment will thus give us new empirical data on how sentences containing *wieder* are in fact interpreted.

2.2.3 Results

The analyses were carried out using the R programming language (R Development Core Team) as linear mixed models, using the program *lmer* (Bates, 2005). The fixed factor was context (neutral / positive). The random factors were subjects and items. Additionally, models with random slopes for both subjects and items were calculated. When an Analysis of Variances (ANOVA) revealed a significant difference between the models, I included the more complex model in the analysis. For each of the analyzed words, trials were deleted if they deviated by 3 standard deviations (SDs) or more from the mean reading time of the respective word. This affected 5% of the data.

2.2.3.1 Questions

All participants answered more than 75% of the comprehension questions which did not target the PSP correctly, suggesting that the participants paid ample attention. The Average accuracy was 91%. The mean accuracy was not influenced by the context (positive or neutral) the target sentence appeared in; in both contexts, mean accuracy of the answers was 91%. Regarding the questions which targeted the PSP, there were differences with respect to the two different contexts. In a positive context, people answered the PSP question with *at least two* 87.5% of the time, with *one* 12%, and with *cannot be answered* 0.5% of the time. When the target sentence was presented in a neutral context, 10.5% of the answers were *at least two*, 88% were *one*, and 1.5% of the time participants chose *cannot be answered* (see Figure 2.2).

2.2.3.2 Acceptability Judgments

Regarding the acceptability judgments elicited, sentences in a neutral context averaged around 1.9, whereas sentences in a positive context received a mean rating of 3.6. This difference was significant ($|t| = 8.24, p < .001$).

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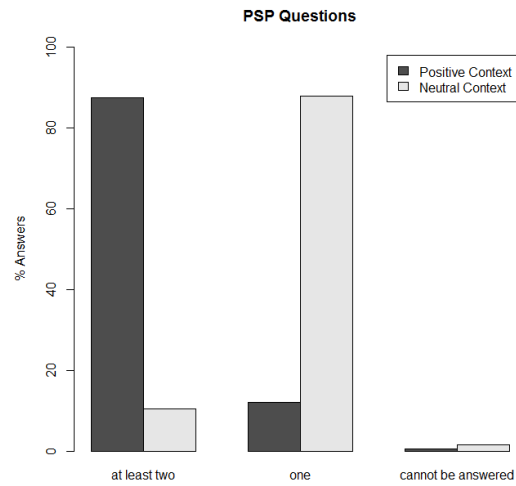


Figure 2.2: Answers for questions targeting the PSP content - Mean answers

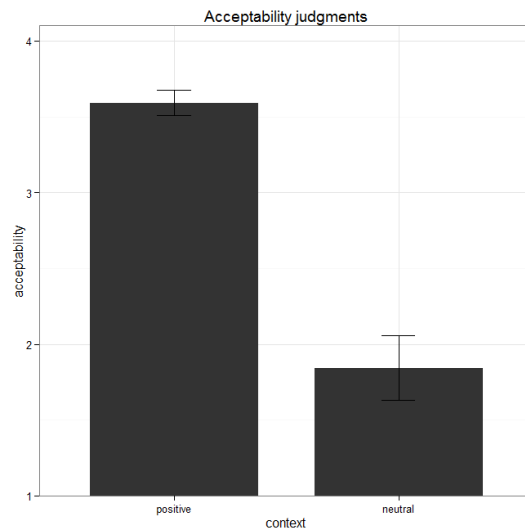


Figure 2.3: Acceptability judgments for Sentences in the two conditions - On a 1-4 scale with 1= very bad and 4 = very good

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2.2.3.3 Reading Times

The reading times for each word are listed in Table 2.1. On the critical word, i.e., the word at which the content of the PSP of *wieder* was evident (*erhalten* in (3-b), repeated in (6)), reading times in the neutral context condition were significantly longer than in the positive context ($|t| = 2.927, p < .05$). This effect was still marginally significant on the spillover region ($|t| = 2.262, p = .058$), and subsided after that on spillover +1 ($|t| = 0.609, p > .1$). On word 14 and 15 (*einer Freundin* in (6)), the sentence in the neutral context condition was read significantly faster than in the positive context condition ($|t| = 2.51, p < .05$, and $|t| = 2.812, p < .05$ respectively)

- (6) Vor zwei Tagen hat Linda wieder eine rosa Lampe erhalten, als sie mit
 Two days ago has Linda again a pink lamp received, when she with
 einer Freundin unterwegs war.
 a friend out was

condition	word 1	word 2	word 3	word 4	word 5	word 6 (<i>wieder</i>)	word 7
positive	359.3	288.8	285.2	284.3	296.8	300	274.4
neutral	357.7	287.5	284.5	284.2	297.7	301	275.8
condition	word 8	word 9	word 10 (crit. word)		word 11	word 12	word 13
positive	274	286.6	394*		295	269.6	262.4
neutral	277.7	286.8	423.9*		303.2	268.5	260.7
condition	word 14	word 15	word 16	word 17			
positive	261.3*	271.1*	271.2	274			
neutral	256*	263*	268.8	272			

Table 2.1: Reading times per word in ms. Asterisks mark significant differences at the $p < .05$ threshold

Figure 2.4 depicts the average reading time for each word of the test sentence in either a neutral or a positive context.

2. FOCUSING ON *WIEDER*: TO ACCOMMODATE OR NOT TO ACCOMMODATE?

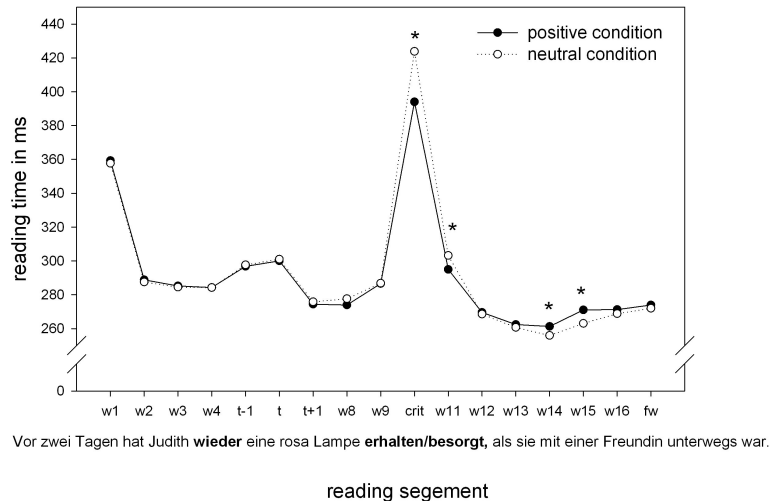


Figure 2.4: Reading times for each word in the two conditions - Asterisks mark differences significant at the $p > .05$ threshold

2.2.4 Discussion

The results of the experiment presented here show that the processor is sensitive to PSPs which are not entailed by the context. This can be gathered from the lower acceptability ratings of a sentence containing a PSP in a neutral context compared to the same sentence in a positive context, as well as the increase in reading times in the neutral condition. The experiment was also designed to target the issue of accommodation by asking questions about the presupposed material. Reading times came apart on the word at which the content of the PSP was fully known to the participant (the critical word), showing that PSPs are computed immediately. Additionally, the results of the PSP questions suggest that participants did not accommodate the PSP of *wieder* in a neutral context. These results are interesting in several ways: First, they provide more evidence for the immediate incremental processing of PSPs. The fact that PSP induced effects show up as soon as the relevant content of the PSP is known and not only at the end of the sentence for example, shows that even meaning components which are not part of the asserted meaning are processed immediately. Secondly, these results offer new insights for linguistic theory with the apparent lack of accommodation which does not lead to complete incomprehensibility of a sentence. Most presupposition theories

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assume that presupposition failure will either lead to an uninterpretable sentence or to accommodation, which is not attested by the results in this experiment. The third surprising result is the late increase of reading times in the positive condition. In the following, I will discuss the two latter findings and what they can tell us about the semantics and processing of *wieder*. From this, I will hypothesize about other PSP triggers and discuss a novel idea about how and when PSPs are accommodated.

2.2.4.1 Missing Accommodation

One thing that is special to an experimental setting versus everyday conversations is that there is no conversation partner that people can interact with. This means that any clarification about the presupposed material is not possible. Therefore, when participants are confronted with a PSP in a neutral context, they face a dilemma: they can either assume something that has never been explicitly mentioned (i.e. they accommodate) or they choose a different strategy in order to make sense of the sentence. In this experiment, it seems that participants went for the second option. In this particular case, the strategy was to disregard the PSP of the sentence altogether and to accept the asserted part only. This means that people took a sentence like (7-a) to mean (7-b) and nothing else.

- (7) a. Today, Linda received a pink lamp again.
b. Today, Linda received a pink lamp.

This seems to be possible in the case of *again* since it does not contribute anything to the asserted part of a sentence. Its only function is to introduce a presupposition, as we can gather from its lexical entry in (8) (cf. Beck (2007)). The presupposition after the colon expresses that there has to be a time t' prior to t'' (which will be the reference time) at which the relevant proposition P was true.¹ The assertion after the dot is simply the identity function.

$$(8) \quad \llbracket \text{again} \rrbracket = \lambda w. \lambda t'. \lambda P_{\langle s, \langle i, t \rangle \rangle}. \lambda t'': t' < t'' \ \& \ P(w)(t'). P(w)(t'')$$

This analysis can be extended to other triggers like *too*, for example. When someone hears a sentence like (9) s/he is most likely inclined to understand the message that

¹The tree in (23) illustrates that the first temporal argument of *again* is a free pronoun. This is what I mean when I say that t' remains free.

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John likes French movies, even though s/he might not know which other relevant person besides John likes French movies. I assume the simplified lexical entry of *too* in (10) along the lines of Beck (2007).¹ Notice that this entry is also such that it does not have any impact on the assertion.

(9) John likes French movies, too.

(10) $\llbracket \text{too} \rrbracket = \lambda w. \lambda P_{\langle s, \langle e, t \rangle \rangle}. \lambda x: \exists y [y \neq x \ \& \ P(w)(y)]. P(w)(x)$

I suggest that people who are faced with a sentence which contains a PSP which is not in the common ground, but who are not in the position to challenge the speaker of such a sentence, go for a strategy in which they ignore the trigger rather than accommodating something out of the blue. Note that there are other scenarios in which someone is not in the position to challenge a speaker than just an experimental setting. Other possible situations might be one where politeness prohibits explicitly challenging the speaker or an ongoing written correspondence via letter or email where it would presumably be too tedious to challenge an unmet PSP.

However, this strategy is not equally available for every expression that is considered to belong to the class of PSP triggers. In a sentence with a definite expression, for example, the definite cannot simply be ignored or else the sentence will not make any sense. That is, for a sentence like (11) the hearer will either have to accommodate that there exists a unique artist who lives next to the speaker or else s/he cannot interpret the sentence.

(11) The artist who lives next to me holds regular yoga sessions.

I assume that the semantic type of *the* is $\langle \langle s \langle s \langle e, t \rangle \rangle \rangle e \rangle$ and has the lexical entry in (12). Combining *the* with a world and a predicate of type $\langle s \langle e, t \rangle \rangle$ will give us an individual of type $\langle e \rangle$.

(12) $\llbracket \text{the} \rrbracket = \lambda w. \lambda f_{\langle s, \langle e, t \rangle \rangle}: \exists! x [f(w)(x) = 1]. \iota y. f(w)(y)$

I have argued that the semantic contribution of *the* is more than just adding a PSP. It takes a world and a predicate as its argument and returns the unique individual of which this predicate holds. This is crucial for semantic composition. The predicate in

¹This entry will be revised in the next chapter

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(11) *holds regular yoga sessions* is of type $\langle s, \langle e, t \rangle \rangle$ and thus wants something of type $\langle e \rangle$ as its second argument. Hence, if *the* was simply ignored, not only would this mean that the semantic contribution of *the* to the assertion would fall by the wayside, but it would also result in a semantic type mismatch. A similar point holds for the triggers *to know* and *to stop*.¹ Both of them make a meaningful contribution to the assertion on top of introducing a PSP:

$$(13) \quad \llbracket \text{know} \rrbracket = \lambda w. \lambda P_{\langle s, t \rangle}. \lambda x: P(w). x \text{ believes } P \text{ in } w$$

$$(14) \quad \llbracket \text{stop} \rrbracket = \lambda w. \lambda t'. \lambda P_{\langle s, \langle i, t \rangle \rangle}. \lambda x. \lambda t: t' < t \ \& \ P(w)(t')(x). \neg P(w)(t)(x)$$

The difference between PSP triggers like factives, change of state verbs, and definite descriptions on the one hand and particles like *again*, *too*, and *even* on the other hand is that the truth of a sentence which contains an item of the latter group can be determined without the PSP trigger whereas this is not possible for sentences with expressions that belong to the former group. This has already been mentioned by Stalnaker (1974) and is discussed in Zeevat (2002) and Zeevat (2004).

When faced with a sentence whose PSP is not given in the context, but which is not needed in order to determine the truth of the assertion, people seem to choose to ignore the PSP trigger altogether rather than to assume something ad hoc that has never been mentioned. From this observation, I generalize the following maxim of interpretation:

Minimize Accommodation

Do not accommodate a presupposition unless missing accommodation will lead to uninterpretability of the assertion!

A similar proposal has already been featured in Moulton (2007). He found that in sentences like (15), people preferably resolved the ellipsis to (16-b) rather than to (16-a), having to accommodate as little as possible.

(15) Jordy carefully reviewed the book that Kiley did Δ .

- (16) a. $\Delta =$ carefully reviewed the book
 b. $\Delta =$ reviewed the book

¹Note that the lexical entry for *stop* also contains a free variable of type *i* - this will become relevant in chapter 3.

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Based on this finding, Moulton (2007) proposes the principle *Accommodate Conservatively*:

Accommodate Conservatively

Do not accommodate more than necessary to satisfy a presupposition.

As we can see, *Minimize Accommodation* is even more radical than *Accommodate Conservatively* insofar that it only calls for accommodation if there is no other way for the sentence to receive a truth value. I suggest that this is a principle that every interpreter adheres to when faced with a situation in which s/he cannot ask for further information regarding the PSP.

I argue that *Minimize Accommodation* divides the class of PSP triggers in (at least) two parts.¹ The first class comprises particles like *again*, *too*, and *even* (**class 1**). These are triggers which will be ignored rather than to accommodate their PSP in the face of PSP failure. Definite descriptions, factives, and change of state verbs are part of the second class of PSP triggers (**class 2**). The PSPs of these triggers will be accommodated because the interpretation of the assertion hinges on the semantic contribution that these trigger make. This kind of distinction between different triggers is very similar to the one put forward in Simons (2001). Yet, it crucially differs in the way that Simons concludes that only the PSPs of class 1 triggers are conventionally encoded in the semantics of the trigger, whereas the PSPs of class 2 triggers are conversationally determined. For the analysis presented here, it is crucial that the PSP is semantically rooted in the lexical entry of class 1 and class 2 triggers, because the assertive contribution that the respective trigger does or does not make, determines whether the PSP has to be accommodated or not. In the next chapter, I will take a closer look at Simons's (2001) proposal and compare it to the analysis presented here.

In light of the analysis presented in this section, it looks as if accommodation really is a last resort operation and even inferior to the reanalysis of a sentence in which the PSP trigger is ignored. A sentence with an unfulfilled PSP cannot only end up as undefined or lead to accommodation, it can also result in a reanalysis of the sentence where people analyze the sentence as if the PSP trigger was not there. The decision of whether to

¹After finishing this chapter it came to my attention that a similar division had already been proposed in Glanzberg (2005). He presents his arguments in an *update semantic* framework, but the idea is very similar at heart.

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accommodate or to reanalyze the sentence is guided by *Minimize Accommodation*. If the sentence can be interpreted without the PSP trigger, ignoring the trigger is always preferred to accommodation. Only when all else fails, will a cooperative interpreter apply accommodation in a last attempt to save the sentence from uninterpretability. It is important to note at this point, that even though the kind of reinterpretation envisaged here saves the sentence from being uninterpretable, it is still a dispreferred move. The low acceptability ratings obtained in the neutral condition are thus not surprising and simply reflect that people perceived a problem with the target sentence in the given context.

There is recent experimental work by Domaneschi et al. (2013) which suggests that the division between different triggers presented here is borne out. The authors report an experiment with auditory stimuli in which they investigated different triggers (definite article, factives, iteratives, change of state verbs, focus-sensitive particles) and how they are accommodated. Their results show that the PSPs of the definite article and factives are more often accommodated than the ones of iteratives and focus-sensitive particles. In their experiment, change of state verbs constitute a middle of the road case in that they pattern with the definite and factive verbs under ‘normal’ conditions. However, as soon as the cognitive load increases, accommodation of the PSP of change of state verbs decreases. The same is true for iteratives but not for the other triggers investigated. Domaneschi et al. (2013) argue that the PSPs of change of state verbs and iteratives are harder to process because they presuppose “temporally displaced events”. I will come back to this issue in the next section when I discuss the late increase of reading times in the positive condition.

I suggest that the interpretation of a sentence with a PSP trigger is processed as depicted in Figure 2.5 on the next page. When the PSP of a sentence is entailed by the context, context update with the asserted proposition can be performed without a problem. If the context does not provide the relevant PSP, the sentence will be reanalyzed and the trigger will be ignored. This is only possible for Class One triggers. In the case of Class Two triggers, the PSP has to be accommodated to make a context update possible. If accommodation is not possible, e.g. because the PSP is too unlikely to be true in the actual world, the sentence will be rejected as uninterpretable.

Two cautionary remarks are in order here. First, the schema above assumes that the hearer of the sentence is not in a position where s/he can openly challenge the speaker.

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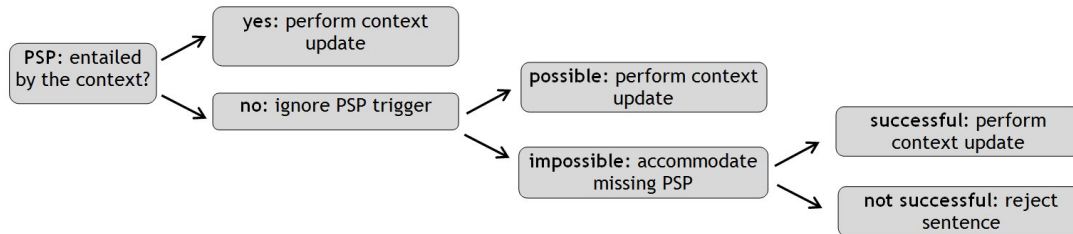


Figure 2.5: Interpretation schema for a sentence containing a PSP trigger -

If a PSP is uttered in an ongoing conversation between two discourse participants of equal status, there is always the option of challenging the PSP e.g. by a *Hey wait a minute* (von Stechow, 2003) response. Right now it is not clear at which point in the interpretation process this will be the case. It could be that the PSP is already challenged as soon as the first step in Figure 2.5 does not lead to a context update. An example for such a scenario is given in (17).

- (17) A: Yesterday, John won the lottery again.
 B: Hey wait a minute! I had no idea that John had won the lottery before.

On the other hand, the fact that many people accommodate the PSP in (18-a) with ease seems to indicate that an unmet PSP is only challenged if the last step depicted in Figure 2.5 cannot be performed successfully. This happens e.g. in cases like (18-b) where world knowledge clashes vastly with what is presupposed.

- (18) a. A: I am sorry I am late, I had to take my cat to the vet.
 b. A: I am sorry I am late, I had to take my elephant to the vet.

I think that the question at which point a hearer challenges a PSP boils down to how likely the PSP is. There is also room for inter-hearer variation. If a hearer is extremely cooperative, s/he will probably only challenge the speaker if all else fails (that is after step three). A less cooperative speaker might already disrupt the conversation after step one fails. The second remark I would like to make here is that everything after step one should only be seen as a repair mechanism. As soon as a PSP is not entailed by the context, the sentence has to be reinterpreted in order to receive a well defined meaning.

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Another point I would like to discuss here is what happens when only a subpart of the PSP of a certain trigger has to be accommodated. Many authors have pointed out that the PSP of *wieder* essentially consists of two parts. First, that the relevant proposition was true at a time other than the reference time and second that the relevant time interval precedes the reference time (cf. Heim (1990), Kamp and Rossdeutscher (1994), van der Sandt and Huitink (2003)). The example from Heim (1990) is repeated in (19).

- (19) a. We will have pizza on John's birthday, so we shouldn't have pizza again on Mary's birthday.
b. We will have pizza on John's birthday, so we shouldn't have pizza on Mary's birthday.

The point is that in (19-a) but not in (19-b) we derive the inference that Mary's birthday succeeds John's birthday. This is due to *again*. More precisely, it is due to the part of the PSP of *again* which introduces the temporal relation and which is obviously accommodated without any effort. How does that fit with what I said above about ignoring *again* rather than accommodating its PSP? The crucial difference between the sentence in (19-a) and the sentences used in the discussed experiment is that in the former but not in the latter, the context already provided a part of the PSP. I will therefore suggest that as soon as parts of the PSP of a certain element are provided in the context, i.e. the context search for parts of the relevant information is successful, the lexical item cannot be ignored anymore. The lexical entry for *again* provides us with a PSP along the lines of (20-b) for the experimental item in (20-a).

- (20) a. Two days ago, Linda received a pink lamp again.
b. PSP: $t' < two\text{-}days\text{-}ago$ & receive(*pink lamp*) (*Linda*) (t')

However, assuming that the trigger can no longer be ignored when parts of the PSP are given in the context, one could argue that as soon as there is some kind of time interval in the context which is suitable to provide a value for the free time variable t' , the whole PSP of (20-a) has to be accommodated. This means as soon as there is another time interval which is prior to *two days ago*, a part of the PSP is fulfilled in the context and thus the trigger can no longer be ignored. Recall that the context

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sentences in the present experiment were such that they provided a time interval of this sort, as the context in (21) illustrates.

(21) Last week, Linda bought Judith a pink lamp for a room.

In principle, since *last week* is prior to *two days ago*, one could assign the free variable the value of *last week* and consequently the first part of the PSP would be fulfilled. But this is obviously not what happens. The interpretation of the PSP of *again* really hinges on the relevant proposition being true at some other time. Only if the context furnishes this, will the temporal connection be made. This means that the interpretation of the PSP of *again* has to proceed in two steps. In a first step, it will be checked if the context provides a suitable proposition to verify the PSP. If this is not the case, the trigger will be ignored as long as it does not make any assertoric contribution. In those cases where the context provides the relevant proposition, the temporal connection will be made and the free time variable can receive its value. When the context does not provide an explicit time which precedes the reference time, this temporal connection will be made by the means of accommodation. I will come back to the proposal that the interpretation of *again* proceeds in two steps in the next part which is devoted to the effect present in the later parts of the test sentences.

2.2.4.2 Late Increase in Reading Times in the Positive Condition

The third relevant result obtained from this experiment is almost as surprising as the missing accommodation. Downstream in the sentence, after the conflict of given versus not given PSP has been realized by the processor, reading times increase in the positive condition, i.e., the condition which explicitly gives the relevant background information. This is surprising insofar that this is the condition which should not impose any problems during processing. So what is behind this late increase in reading times? The first thing we might want to look at is the part of the sentence on which the effect became apparent.

(22) a. (i) Letzte Woche hat Linda Judith eine rosa Lampe für ein Zimmer
last week has Linda Judith a pink lamp for a room
gekauft.
bought

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- (ii) Letzte Woche hat Judith Linda eine rosa Lampe für ein Zimmer
last week has Judith Linda a pink lamp for a room
gekauft.
bought
- b. Vor zwei Tagen hat {(a) Linda / (b) Judith} wieder eine rosa Lampe
ago two days has {(a) Linda / (b) Judith} again a pink lamp
erhalten, als sie mit **einer Freundin** unterwegs war.
received, when she with **a friend** out was

In the above example from the experimental material, the reading times in the neutral and positive condition came once more apart on word 14 and word 15, i.e. *a friend*. Since the sentences were constructed as parallel as possible, word 14 and word 15 were always indefinite NPs. So a first guess might be that the difference in reading times has something to do with the indefinite NP. It is not clear, however, why the indefinite NP should impose more processing difficulty in the positive than in the neutral context, since both contexts vary only with respect to who gave what to whom (or more generally: Who did what to who). Thus, the observed effect cannot be due to the nature of the sentence material at this point.

Another very likely hypothesis is that participants did not interpret the rest of the sentence as deeply after they realized that its PSP was not met. The observed difference between the positive condition and the neutral condition would thus not be an increase of reading times in the positive condition, but rather a decrease in the neutral condition. By looking at the raw reading times alone, it is almost impossible to determine whether the reading times have risen in the positive condition or fallen in the neutral condition. However, there are other indicators which can help us to clarify whether participants stopped interpreting the sentence in the neutral condition after they realized the lacking PSP. Recall the results for the comprehension questions. The comprehension questions after each sentence were such that they very often targeted the material introduced in the later part of the sentence. If it was the case that people stopped interpreting the sentence in depth after the critical word in the neutral condition, they should give more false answers compared to the positive condition. We have seen, however, that context condition did not influence the percentage of correct answers at all. In both contexts, questions were answered accurately 91% of the time. Assuming that decreased attention results in lower accuracy, the results concerning the comprehension questions provide a strong piece of evidence against the hypothesis that interpretation

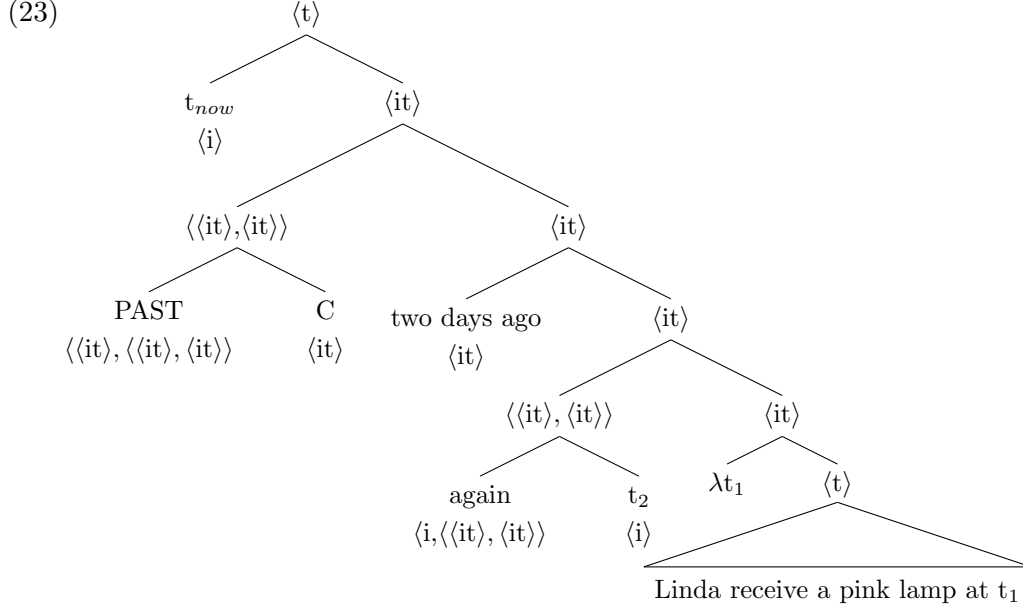
2. FOCUSING ON *WIEDER*: TO ACCOMMODATE OR NOT TO ACCOMMODATE?

diminished in the neutral condition. Another argument counter the explanation that participants stopped interpreting the sentence in the neutral condition in depth comes from the fact that the difference in reading times appears to be local. If people really gave up on the sentence when the PSP was not given in the context, it is not clear why the observed reading time difference does not persist until the end of the sentence. I will therefore conclude that the late difference in reading times is not explained by the processor “giving up” in the neutral condition.

So how can we account for this difference, then? I will argue that the answer to this question is tightly connected to *Minimize Accommodation*. Recall that *Minimize Accommodation* basically says that you should ignore the meaning contribution of a trigger as long as it does not change the assertion of the sentence. As discussed in the last section, this is possible in the case of *wieder*. In Figure 2.5, I proposed a schema according to which people interpret PSPs. In terms of the time course of interpretation, I am assuming that people go through the individual steps outlined in the schema very quickly and as soon as they are able to calculate the PSP of a given sentence. This is reflected in the relatively long reading times on the critical word in comparison to the other words in the sentence. Consequently, if it is already determined at the critical word that the contribution of *wieder* should be neglected, the only difference at the point the relevant effect arises is that the meaning of *wieder* still plays a role in the positive but not in the neutral condition. After compositional interpretation of the structure in (23), the truth conditions of the sentence in (23) are the same in the positive condition (25-a) and (25-b) in the neutral condition.¹ However, while the sentence as a whole does not carry a presupposition in the neutral condition, it still carries one in the supporting condition. I will assume the quantificational entry for PAST in (24) where C is a contextual restriction which picks out the relevant temporal subset. Under this analysis of PAST as a quantifier, we have to deal with projection of t_2 . For the moment I will assume without further justification that t_2 projects existentially. The issue of presupposition projection will be discussed in depth in chapter 4. For the temporal adverbial *two days ago*, I am assuming the analysis in von Stechow (2009) in which they provide a restriction for the time intervals the tense operator quantifies over.

¹For ease of presentation, I am leaving out the world variables in this derivation. They are still important to capture the meaning of PSPs, of course.

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(24) $\llbracket \text{PAST} \rrbracket = \lambda C_{\langle it \rangle} . \lambda P_{\langle it \rangle} . \lambda t . \exists t' [C(t') \ \& \ t' < t \ \& \ P(t')]$

- (25) a. $\exists t' [C(t') \ \& \ t' < t_{now} \ \& \ \text{receive}(t')(pink \ lamp)(Linda) \ \& \ t' \subseteq \text{two-days-ago}]$
PSP: $\exists t' [C(t') \ \& \ t_2 < t' \ \& \ \text{receive}(t_2)(pink \ lamp)(Linda)]$
 b. $\exists t' [C(t') \ \& \ t' < t_{now} \ \& \ \text{receive}(t')(pink \ lamp)(Linda) \ \& \ t' \subseteq \text{two-days-ago}]$

If we take a closer look at (25-a) and (25-b) we see that the only relevant difference between the two truth conditions is that (25-a) has a free variable of type $\langle i \rangle$ at the level of PSP which (25-b) does not possess. As I have briefly mentioned in the last section, I assume that the interpretation of the PSP of *wieder* is a two step process. The first step is initiated as soon as the PSP can be calculated. In this step, the processor searches the context for a proposition which can potentially fulfill the PSP (i.e. that Linda received a pink lamp). If the context does not provide such a proposition, the processor will choose to ignore the contribution of *wieder* altogether. In those contexts which provide the necessary background information, the second step is to assign a value to the free temporal variable in the PSP of *wieder*. I suppose that this step is what is behind the late increase in reading times in the positive condition. Assuming that the core part of the PSP is already dealt with in an earlier step in both conditions, the free time variable is the only thing that distinguishes the sentence in the positive

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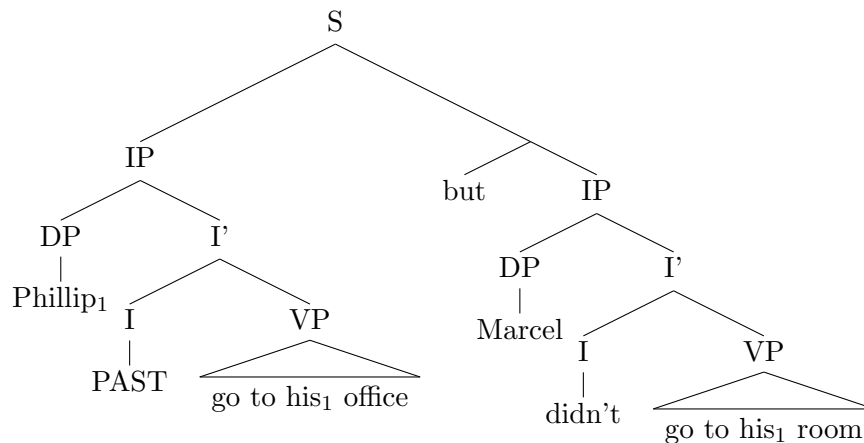
condition from the sentence in the neutral condition.

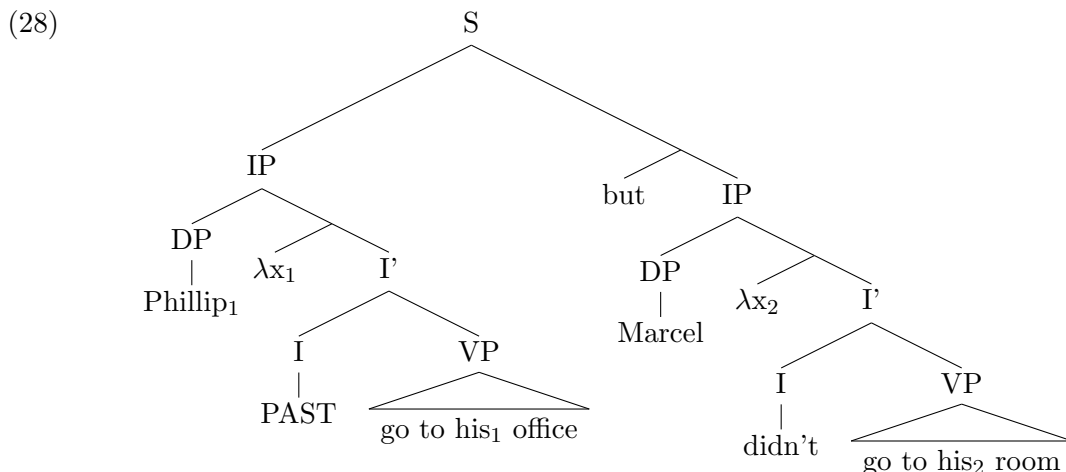
To my knowledge, no one has ever investigated free variables at the level of PSP experimentally. Thus, it is very hard to find evidence backing my assumptions. There is, however, work on the processing of free versus bound individual variables at the level of LF which shows that assigning a value to a free variable is more costly than interpreting a bound variable. In an eye-tracking experiment, Koornneef (2008) tested whether participants exhibit a preference for sloppy over strict readings in elliptical sentences. A sentence like (26), adapted from Heim and Kratzer (1998), can have a sloppy or a strict reading.

(26) Philipp went to his office but Marcel didn't.

The sloppy reading is the reading where the ellipsis in the second part of the sentence is understood as *Marcel didn't go to Marcel's office*. On the strict reading, the ellipsis is resolved to match the overt material in the sentence, i.e. to mean *Marcel didn't go to Phillip's office*. According to Heim and Kratzer (1998), the strict reading comes about by treating *him* in both the antecedent and the ellipsis as free variable which receives its value via the variable assignment function, see (27). Under the sloppy reading, both occurrences of the pronoun *his* are bound by a lambda abstractor at the level of LF (28).

(27)





In a reading experiment using eye-tracking, Koornneef (2008) presented sentences which exhibit such an ambiguity (as in (29-b)) in two contexts.¹ One which biased the interpretation to a strict reading (29-a-i) and another one which made the sloppy reading prominent (29-a-ii).

- (29) a. (i) Lisa and Anouk love the music channel MTV. Lisa was very happy when she was selected for the show 'Pimp My Room', in which her room was redecorated.
- (ii) Lisa and Anouk love the music channel MTV. They were very happy when they were selected for the show 'Pimp My Room', in which their rooms were redecorated.
- b. Sadly,/ Lisa/ thinks that/ her/ pimped room/ has a/ touch of class,/ but Anouk does not.

The results reveal that there are two types of readers: the “energetic” ones and the “lazy” ones. According to Koornneef (2008), energetic readers make the decision between a free and a bound variable interpretation already upon encountering the pronoun *her*. This means that in a context which favors a strict reading, energetic readers interpret *her* as a free variable while a context with a sloppy bias leads them to bind the pronoun. Crucially, this decision results in a difference in reading times on the region after the pronoun. Here, the energetic readers exhibited longer reading times in a strict-biased context than in a sloppy-biased context, indicating that processing

¹Slashes indicate the regions of interest (ROIs).

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a free variable is more laborious than the interpretation of a bound variable. For the energetic readers, no significant difference emerges on the ellipsis region. Presumably because they have already committed to a strict versus sloppy reading before. For the lazy readers, there was no significant difference at the position of the pronoun. They, however, exhibited a difference in reading times in the ellipsis region where the strict-biased condition took longer to read than the sloppy-biased condition. What is important for our discussion is that, neglecting different types of readers, the bound reading was always easier to process than the reading in which the variable was free. Moreover, for the energetic readers, the effect of bound versus free variable did not emerge on the pronoun itself but on the two words after the pronoun. Considering that the effect in the *wieder* experiment also emerges further downstream than where the free variable occurs, this finding suggest that we are dealing with a similar phenomenon. An additional factor which could be responsible for the late emergence of difficulty is the two step PSP interpretation model which I have argued for in this chapter. (30) makes this model explicit.

(30) **Two step interpretation model for *again*:**

Step one: Check if relevant proposition can be met by the context. If not, ignore trigger.

Step two: If the relevant proposition can be verified, assign value to the free time variable via the variable assignment function.

The idea that the interpretation of *again* proceeds in these two steps gains additional support from experimental work on other kinds of reference processes. In the psycholinguistic literature, it has been argued extensively that reference processes are made in two steps (e.g. Garrod and Sanford (1994), Garrod and Terras (2000), Sanford et al. (1983), Sturt (2003)). These authors argue that referential expressions like pronouns are processed first in a *bonding* phase, followed by a *resolution* phase. Garrod and Terras (2000) describe this two step process as follows: “(1) a low-level automatic process associated with establishing some kind of link between the potential role-filler and a previous verb, which we call *bonding*, and (2) a later process which tests and resolves the link with respect to the overall discourse representation, which we call *resolution*.” This is very much in line with the model of interpretation for *again* which

I have proposed in this chapter. Moreover, it suggests that there are substantial similarities between the processing of a referential PSP and other referential phenomena. This finding can lead us to a more general picture of how reference processes are made during processing and shows that PSPs are not a singular phenomenon without any connection to other phenomena in sentence processing.

2.3 Conclusion

This chapter set out with the question of how the PSP of *wieder* is processed online and whether its PSP is accommodated in a context which does not entail the relevant proposition. To this end, a self-paced reading experiment was conducted which presented a target sentence containing *wieder* in a context which introduced the relevant background information and a context which failed to do so. Additionally, questions which targeted the presupposed information were asked. The results show that in a context which does not support the PSP of *wieder*, processing effects emerge as soon as the PSP is known to the reader. This finding suggests that PSPs are processed and evaluated immediately. Assuming that pragmatic reasoning applies after semantic evaluation, this result might be taken to indicate that the PSP of *wieder* is semantically encoded in the trigger and does not arise by pragmatic reasoning as some theories suggest (e.g. Simons (2001), Abusch (2009), Schlenker (2008), Abrusán (2011)). This might not be extremely surprising for a trigger like *again* which most of these theories discuss as a ‘conventional’ trigger. I will therefore return to this issue in the next chapter which takes a closer look at PSP trigger other than *again*.¹

The experiment brought to light two additional findings which are not easily accounted for by existing theories. The first one being the apparent lack of accommodation when the PSP of *wieder* is not given in a context. According to most theories, such a scenario should either lead to accommodation or interpretation failure. However, answers concerning the relevant PSPs showed that participants did not go either route. Instead, they chose to ignore the PSP introduced by *wieder* (and consequently *wieder*

¹There is experimental work which shows that scalar implicatures are processed very rapidly (e.g. Grodner et al. (2010); Breheny et al. (2013)). Since most theories view them as a pragmatic phenomena, this seems to suggest that even pragmatic considerations enter processing very quickly. However, there are also theories which analyse these kinds of implicatures as part of the semantics (e.g. Chierchia (2004)). I will come back to this issue in the chapter 3.

2. FOCUSING ON *WIEDER*: TO ACCOMMODATE OR NOT TO ACCOMMODATE?

itself) and interpret the assertion only. I proposed that this is possible because *wieder* does not contribute anything semantically to the literal content of a sentence other than the PSP. Based on this observation, I introduced the principle *Minimize Accommodation* and suggested that accommodation is only a last resort option in those cases where the PSP trigger makes a meaningful contribution to the compositional interpretation of a sentence. This suggests that the PSP of the definite article and change of state verbs has to be accommodated whereas this is not the case for the PSPs of *too* and *even*. And indeed, the experiment presented in Domaneschi et al. (2013) supports this hypothesis. Moreover, their observation that change of state verbs and iteratives are harder to process because they presuppose “temporally displaced events” can be linked directly to the third important result obtained from the experiment presented in this chapter.

The third interesting result of the present experiment is the late increase in reading times in the positive condition, i.e. when the PSP of *wieder* was given in the context. I have argued that this effect comes about by assigning the free temporal variable, which is an argument of *wieder*, a contextual value. This happens after an initial process which checks whether the context contains a proposition which could potentially fulfill the PSP of *wieder*. If this process turns out not to be successful (i.e. in the neutral condition), the contribution of *wieder* does not play any further role for the interpretation of the sentence. If, however, the context provides the relevant information, *wieder* is interpreted as usual. In this case, the time variable argument of *wieder* becomes relevant. Recent experimental work by Koornneef (2008) has shown that the interpretation of a free variable is more laborious than interpreting a bound variable. Assuming that assigning a value to a free variable is costly in general can explain the observed discrepancy between the positive and the neutral condition in the experiment presented here.

On the basis of these results, I have argued for a two step interpretation model for *again*, similar to what has been proposed in the literature for the resolution of pronouns. Both pronouns and a trigger like *again* are anaphoric and similarities in processing are thus to be expected. The proposed processing model for *again* is hence a first step towards making this link and should apply for all anaphoric triggers equally. This is very reminiscent of a theory which treats PSPs as anaphora (van der Sandt, 1992). However, this is not what is meant here. van der Sandt (1992) claims the PSP triggered

by *again* (and all other PSP triggers) itself to be an anaphor. In contrast, the analysis presented here assumes *again* to introduce a partial function which is dependent on an anaphoric element.

The view presented here has interesting consequences for the theory of PSPs. I have laid out above how *Minimize Accommodation* assumes two classes of PSP triggers: Those whose PSP has to be accommodated and those whose PSP does not have to and eventually is not accommodated. A similar case can be made about triggers which take a free variable as their argument and triggers which do not. The next chapter will discuss different triggers with respect to these aspects and the hypotheses that follow from such a distinction. These will be contrasted to other theories which assume other differences between PSP triggers.

**2. FOCUSING ON *WIEDER*:
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3

Wieder and other Triggers

3.1 Introduction

In the last chapter I have argued that the way in which *wieder* is processed is due to the lexical properties of *wieder*. First, *wieder* is one of those triggers which do not contribute anything to the truth conditional meaning of a sentence other than the PSP. Second, it is special in that it is a referential trigger which introduces a free variable at PSP level. The last experiment has shown that the first characteristic leads people to ignore *wieder* rather than to accommodate its PSP. This interacts closely with the second characteristic. When the contribution of *wieder* is ignored, the free variable is also ignored. But when the PSP of *wieder* is given in the context, the free variable has to be assigned a value. I have argued that this process is costly and results in inflated reading times.

As I have pointed out in the first chapter, we do no good in looking at one PSP trigger only and then generalizing over all triggers. It is therefore necessary to broaden our view and investigate other triggers as well. The experiment presented in this chapter does exactly this. Besides *wieder*, it comprises the factive verb *wissen* ('to know'), the definite article in the form of a possessive pronoun, the change of state verb *aufhören* ('to stop'), and the additive particle *auch* ('too'), all of which have been claimed to trigger PSPs (cf. Beaver and Geurts (2011)). However, there is a lively debate in the linguistic literature about how the respective PSPs come about. To date, there is no consensus on whether 1. all PSPs are semantically encoded in the meaning of certain words (e.g. Heim and Kratzer (1998)), 2. some PSPs are semantically encoded in the

3. *WIEDER* AND OTHER TRIGGERS

trigger and some arise by pragmatic reasoning (Karttunen, 1974; Soames, 1982), or 3. all PSPs are a purely pragmatic phenomenon (e.g. Atlas and Levinson (1981)). The triggering problem has regained some attention recently in the works of Simons (2001), Abusch (2002), Abrusán (2011) who all make a strong case that at least some PSPs are triggered pragmatically. This could well mean that the PSPs of different triggers are processed differently. But even when adopting a ‘semantics-only’ view, which roots the source of the PSP in the lexical entry of the respective trigger, the triggers used in this experiment are by no means homogeneous. Based on the discussion in the last chapter on *wieder*, I will lay out the differences for the triggers used in the present experiment and hypothesize how the individual characteristics could influence processing.

The next section will introduce some of the theories which have been proposed for the triggers under discussion. In the subsequent section I will lay out how these triggers pattern when we assume a ‘semantics-only’ view of things. The section after that introduces the experiment, the predictions, and the results which will then be discussed in the final section.

3.2 Pragmatic Presuppositions (Simons (2001); Abrusán (2011))

In recent years, the discussion about how PSPs are triggered has experienced a new revival. Most prominently, Simons (2001), Abusch (2002), and Abrusán (2011) have discussed ways to derive PSPs which are not encoded in the lexical meaning of a word per se. In this section, I will introduce the theories of these authors and discuss the possible hypotheses about PSP processing that could be drawn from them.

In her paper, Simons (2001) discusses a couple of observations about certain PSPs which she takes to suggest that not all PSPs are inherently semantic. The first issue she discusses is the *contextual defeasibility* of some PSP triggers like change of state predicates and factives. An example to illustrate this point from Geurts (1994) is given below.

- (1) I notice that you keep chewing on your pencil. Have you recently stopped smoking?

3.2 Pragmatic Presuppositions (Simons (2001); Abrusán (2011))

We have seen before that PSPs normally survive even in questions. Yet, the PSP in the question in (1) seems to “disappear” because of the implicit ignorance expressed in the first sentence. Simons (2001) points out that the same does not hold for the PSP triggered by *again* in (2).

- (2) #I don’t know if Jane ever rented “Manhattan” before, but perhaps she’s renting it again.

Here the PSP of *again* seems to project even though the first part of the sentence asserts explicit ignorance. Consequently, the sentence sounds odd. Simons (2001) contrasts the observation made about certain PSPs in ignorance contexts with the behavior of implicatures when ignorance is expressed overtly as in (3).

- (3) George has three children, and may have more for all I know.

Here, the scalar implicature (that George has exactly three children) is canceled by the second conjunct. Simons (2001) takes the fact that some PSPs behave just like implicatures in certain environments to be a first argument for the pragmatic status of these PSPs.¹

Another point she brings forth in favor of a pragmatic treatment of at least some PSPs is *nondetachability*. Here, again, she draws a parallel to implicatures. Since conversational implicatures are not tied to a specific lexical expressions, but arise by pragmatic reasoning, it does not matter which of the sentences in (4-b) through (4-e) Julia chooses to convey the implicature that she does not want to go out for a drink.

- (4) a. Jane: Do you want to go out for a drink?
b. Julia: I have to finish writing my SALT paper.
c. Julia: I need to finish my SALT paper.
d. Julia: My SALT paper needs to get finished tonight.
e. Julia: I have to work on my SALT paper.

Simons says that the same holds true for change of state verbs and factives. She illustrates this with the example in (5). No matter which of the three expressions is chosen, the sentence always carries the same PSP.

¹But note that the debate on whether scalar implicatures are truly pragmatic is by no means settled, see e.g. Chierchia (2004) for a semantic account of scalar implicatures.

3. *WIEDER* AND OTHER TRIGGERS

(5) Harry didn't realize / come to know / become aware that he was a fool.

Simons (2001) takes this observation to suggest that the PSPs of factives and change of state verbs, just like implicatures, are not tied to a single lexical expression but to the content expressed in a sentence. Moreover, she points out that the pattern observed here suggests a generalization rather than a theory which assumes that each of these expressions carry their own presuppositional properties which then would have to be learned for each item individually.

Based on these observations, Simons (2001) proposes that the PSPs connected with factives and change of state verbs are pragmatic in nature. In her proposal, she draws on an observation made in Stalnaker (1974):

The propositions that P and that Q may be related to each other, and to common beliefs and intentions, in such a way that it is hard to think of a reason that anyone would raise the question whether P, or care about its answer, unless he already believed that Q.

This means in essence, to utter a sentence like *John knows that Sally is pregnant* aims at answering a question of whether John's believes state is or is not such that he thinks that Sally is pregnant. The fact that Sally is pregnant, however, is (in the terms of Simons et al. (2011)) not at-issue.

In her paper, Abrusán (2011) spells out an algorithm which predicts the PSPs of sentences with so-called soft triggers. Specifically, she addresses the PSPs connected with factive verbs, change of state predicates, emotives, and achievement verbs. Her central idea is that PSPs which arise in connection with the mentioned lexical items are determined by the cognitive language system in a bottom-up process. This process determines which entailments of a sentence are not about the same time interval as the matrix predicate. Abrusán (2011) argues that it is precisely these entailments which end up as being presupposed. Since the experiment presented in this chapter includes the factive verb *to know* and the change of state predicate *to stop*, I will exemplify her argument with these two triggers.

For a sentence like (6), Abrusán (2011) assumes that both predicates come with their own temporal argument. Some of the entailments of (6) are the ones given in (7) on the next page.

3.2 Pragmatic Presuppositions (Simons (2001); Abrusán (2011))

- (6) John knows (at t_1) that it was raining (at t_2).
- (7) a. John knows at t_1 that it was raining t_2
b. John believes at t_1 that it was raining at t_2
c. It was raining at t_2
d. It was humid at t_2
e. John's belief is justified at t_1

On a very intuitive notion but also conceptually, only (7-c) and (7-d) are not about the time interval introduced by the time variable of the matrix predicate *to know* and thus end up as being presupposed.

Abrusán (2011) makes a similar point about change of state predicates such as *stop*. The biggest difference between *stop* and *know* is maybe that the time variable of the relevant entailment is not introduced at LF for a sentence containing *stop*.¹ Nevertheless, Abrusán (2011) assumes that the sentence in (8) has the entailments given in (9).

- (8) John stopped smoking at t_1 .
- (9) a. John does not smoke at t_1
b. John smoked at t_2 (where t_2 is some contextually given interval before t_1)
c. John stopped smoking at t_1

This time only (9-b) is not about the matrix time and will therefore end up as the PSP of the sentence as a whole.

In her paper, Abrusán remains agnostic about how the entailments of the respective sentences arise in the first place. She also does not talk about particles such as *again* but explicitly restricts her analysis to soft triggers. Thus, for the time being, I will assume that Abrusán's (2011) theory only applies to soft triggers and is not expendable to other triggers like *too*, *again*, and the definite determiner.² If it turns out that this assumption is not correct, the hypotheses about the clustering of the PSPs triggered by these words will have to be amended, of course. Yet, one crucial fact remains. The process Abrusán

¹That is if we do not assume the lexical entry for *stop* introduced in the previous chapter.

²Even though the definite determiner isn't considered a *hard* trigger, I cannot see how Abrusán's analysis can be carried over to the NP domain, since NP denotations are most of the time interpreted at the same time as the matrix predicate.

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proposes operates over sentence entailments. This means that the PSPs of a sentence can only be determined after the sentence's truth conditions are established. In other words, PSP processing should succeed the processing of asserted meaning. This is the exact opposite of the picture I laid out in the last chapter and which I will elaborate on below. In section 3.4.2, I will compare the different processing predictions that can be plausibly deduced from pragmatic theories such as the two discussed in this section and a semantic theory along the lines of the one presented in the next section.

3.3 A Semantic View

Even though many arguments have been made for the case that the PSPs of soft triggers arise by pragmatic reasoning, many of the authors who advocate this view seem to consider the PSP of *again* a semantic one. For example, Simons (2001) explicitly says that "...the presuppositions of, say, change of state sentences are derived very differently from the presuppositions generated by *even*, *too*, and *again*, which plausibly have a conventional source." In the last chapter I have discussed *again* as a trigger which has the PSP constraint encoded in the lexical entry. I have also shown which consequences arise if we assume such a lexical entry. In the discussion of *Minimize Accommodation*, I have briefly hinted at other triggers and how their contribution to the assertoric part of a sentence plays a crucial role in whether their PSP has to be accommodated or not. The central idea is thus that all PSP triggers have the respective PSP encoded into their lexical entry. In this section, I will lay out the differences between the individual PSP triggers tested in the present experiment. We will see that there are basically three classes of triggers: Those which contribute nothing to the literal content of a sentence and are referential in nature, those which make a contribution to the assertion and are referential, and those which make an assertoric contribution but are not referential.¹

From the discussion in the preceding chapter it should have become clear already that I consider *again* to belong to the first class of triggers mentioned above. The lexical entry of *again* is repeated below as a reminder and as a starting point to get the discussion about other triggers off the ground.

¹By saying that a trigger is referential, I mean that the first argument of type <i> is a variable which remains free at the level of the PSP.

$$(10) \quad \llbracket \text{again} \rrbracket = \lambda w. \lambda t'. \lambda P_{\langle s, \langle i, t \rangle \rangle}. \lambda t'': t' < t'' \ \& \ P(w)(t'). P(w)(t'')$$

Remember that we postulated the time variable as *again*'s second argument because *again* seems to call for a specific time interval at which the relevant proposition held true rather than just requiring that there exists some time at which the proposition was true. The question is now whether there are other PSP triggers to which the same reasoning applies. As many authors have pointed out already, *again* and *too* seem to be very similar in spirit. In the last chapter, I have pointed out that both belong to the class of triggers which do not contribute anything to the assertion of a sentence and people thus choose to ignore them rather than to accommodate their PSP. Let us take a look at the lexical entry for *too* assumed in the last chapter, see Beck (2007)¹:

$$(11) \quad \llbracket \text{too} \rrbracket = \lambda w. \lambda P_{\langle s, \langle e, t \rangle \rangle}. \lambda x: \exists y[y \neq x \ \& \ P(w)(y)]. P(w)(x)$$

The lexical entry above is such that *too*, just like *again*, makes no truth conditional contribution. However, there is also no free variable at PSP level. So is *too* in this respect different from *again*, then? The famous example by Kripke (2009) in (12) tells us otherwise.

$$(12) \quad \text{John is having dinner in New York, too.}$$

Even though the PSP in (12), assuming the lexical entry for *too* in (11), is trivially fulfilled by the fact that there are probably thousands of people who are having dinner in New York besides John, the sentence is still odd. Rather than assuming that *too* triggers an existential PSP that someone other than John is having dinner in New York, we want the PSP to be about a specific person. It therefore makes sense to assume a referential entry for *too* as well. This entry is given in (13).

$$(13) \quad \llbracket \text{too} \rrbracket = \lambda w. \lambda y. \lambda P_{\langle s, \langle e, t \rangle \rangle}. \lambda x: y \neq x \ \& \ P(w)(y). P(w)(x)$$

With this entry in place, we can see that *again* and *too* are indeed very similar. They cluster into the group of PSP triggers which do not make an assertoric contribution and are referential.

¹This is a very simple version of the lexical entry of *too*. A more complex entry should be able to account for the focus sensitivity of *too*. For the present purpose, this simple entry will suffice.

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Next, I will turn to a class of PSP triggers which are similar to the afore-mentioned group with respect to referentiality. Heim (1990) observes that in a sequence of sentences like in (14), we get the relatively odd inference that the cooking event initiated by John will last through the night until tomorrow's football game.

(14) John is cooking. He will stop (cooking) when tomorrow's football game starts.

Here, again, the conventional view would be that *stop* introduces a PSP which requires that there is an event which lasts until just before the reference time of the sentence. The example in (14), however, makes clear that this event (or the running time of the event) is specific rather than existential. This is already taken care of in the lexical entry introduced in the last chapter, repeated below.¹

(15) $\llbracket \text{stop} \rrbracket = \lambda w. \lambda t'. \lambda P_{\langle s, \langle i, t \rangle \rangle}. \lambda x. \lambda t: t' \infty t \ \& \ P(w)(t')(x). \neg P(w)(t)(x)$

According to this view, *stop* is similar to *again* and *too* insofar that it also takes a variable as its second argument which will remain free in the course of compositional computation. However, it differs from the two particles in its meaningful contribution to the assertion. In the terms introduced in the last chapter, *too* and *again* belong to the Class One triggers, whereas *stop* belongs to the Class Two triggers. Yet, *stop* is different from other Class Two triggers like e.g. *to know* and the definite article. As discussed in the last chapter, change of state verbs and the definite article belong to the class of triggers which contribute something to the literal meaning of the sentence and thus cannot be ignored. The lexical entries for *know* and the definite article are repeated in (16) and (17) respectively.

(16) $\llbracket \text{know} \rrbracket = \lambda w. \lambda P_{\langle s, t \rangle}. \lambda x: P(w).x \text{ believes } P \text{ in } w$

(17) $\llbracket \text{the} \rrbracket = \lambda w. \lambda f_{\langle s, \langle e, t \rangle \rangle}: \text{there is exactly one } x \text{ is } w, \text{ s.t. } f(w)(x) \text{ is true. the unique } y, \text{ s.t. } f(w)(y)$

We have seen that *know*, *stop* and the definite article are such that they cannot be ignored due to the lexical contribution of the triggers. However, *know* and the definite article are also different from *stop* because they do not exhibit a free variable at PSP level. In the last chapter, I have discussed how the free variable at PSP level has

¹ ∞ indicates that t' and t are abutting, i.e., that there is no time interval t'' between t' and t .

an influence on processing in the case of *again*. Consequently, processing differences between *know* and the definite article on the one hand and *stop* on the other hand are expected. The exact predictions of the different theories discussed in this section will be laid out in section 3.4.2.

3.4 Experiment: *Weider* and Other Triggers¹

This experiment sets out to test the different processing hypotheses laid out above. In the last sections I have discussed that pragmatic theories in the spirit of Simons (2001) and Abrusán (2011) assume the PSP of soft triggers like *to know* and *to stop* to arise differently from the PSPs connected to triggers like *again*, *too*, and presumably the definite article. According to a semantic theory like the one advocated in chapter two, however, PSP triggers cluster into three categories: 1. no truth conditional contribution & referential, 2. truth-conditional contribution & referential, and 3. truth-condition contribution & not referential. The objective of the present study is to test whether these characteristics play a role in sentence processing.

3.4.1 Method and Materials

In order to test the predictions which the different PSP theories make, we tested five PSP triggers: *again*, *too*, the definite article in the form of the possessive pronoun, *stop*, and *know*. It was of special interest how sentences are processed when their PSP is given in the context versus sentences whose PSPs are not given in the context. Thus, positive and a neutral context just like in the last experiment were included. Additionally, a third level was added to the factor **context** in which the context was manipulated in such a way that it explicitly falsified the relevant PSP. One example item for each trigger is given below. Test sentences like the one in (18-b) were presented in three different context sentences: **positive** (18-a-i), **negative** (18-a-ii), and **neutral** (18-a-iii). Below is an example item for each of the five triggers as used in the experiment.²

¹The experiment presented here is Tiemann et al.'s (2011) *accommodation study*. Here, I am presenting a new analysis and discussion of the results for the individual triggers which is not part of Tiemann et al. (2011).

²See Appendix for all test items.

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again

- (18) a. (i) Susanne hat bereits rote Handschuhe gekauft.
Susanne had already red gloves bought.
'Susanne had bought red gloves before.'
- (ii) Susanne hat bisher nie rote Handschuhe gekauft.
Susanne had until now never red gloves bought.
'Susanne had never bought red gloves until now.'
- (iii) Inge hat bisher nie rote Handschuhe gekauft.
Inge had until now never red gloves bought.
'Inge had never bought red gloves until now.'
- b. Heute hat Susanne wieder rote Handschuhe gekauft und sie
Today has Susanne again red gloves bought and them
gleich angezogen.
immediately put on
'Today, Susanne bought red gloves again and put them on right away.'

too

- (19) a. (i) Fritz kocht heute eine Suppe mit Tina.
Fritz is cooking today a soup with Tina
'Fritz is cooking soup with Tina today.'
- (ii) Niemand kocht heute eine Suppe mit Tina.
Nobody is cooking today a soup with Tina
'Nobody is cooking soup with Tina today.'
- (iii) Niemand isst heute eine Suppe mit Tina.
Nobody is eating today a soup with Tina
'Nobody is eating soup with Tina today.'
- b. Sie hofft, dass auch Susanne eine Suppe mit ihr kocht und kauft dafür
She hopes that too Susanne a soup with her cooks and buys for it
Zutaten.
ingredients
'She hopes that Susanne will cook a soup with her, too, and shops ingredients for it.'

stop

- (20) a. (i) Karl hilft in einem Altersheim aus.
Karl helps in a home for the elderly out
'Karl is doing honorary work in a home for the elderly.'

3.4 Experiment: *Weider* and Other Triggers

- (ii) Karl hilft nicht in einem Altersheim aus.
Karl helps not in a home for the elderly out
'Karl isn't doing honorary work in a home for the elderly.'
- (iii) Susanne hilft in einem Altersheim aus.
Susanne helps in a home for the elderly out
'Susanne is doing honorary work in a home for the elderly.'
- b. Karl wird aufhören in einem Altersheim auszuhelfen und
Karl will stop in a home for the elderly to help out and
teilt dies seinem Vorgesetzten mit.
shares this his boss with
'Karl will stop doing honorary work in a home for the elderly and informs
his boss.'

definite article

- (21) a. (i) Tinas Bruder hat ein Taxi.
Tina's brother has a taxi
'Tina's brother owns a taxi.'
- (ii) Tinas Bruder hat kein Taxi.
Tina's brother has not a taxi
'Tina's brother doesn't own a taxi.'
- (iii) Tinas Bruder hat ein Fahrrad.
Tina's brother has a bicycle
'Tina's brother owns a bicycle.'
- b. Sie leiht sich sein Taxi und fährt nach Potsdam.
She borrows herself his taxi and drives to Potsdam
'She borrows his taxi and drives to Potsdam.'

know

- (22) a. (i) Tina ist nicht in Fritz verliebt.
Tina is not in Fritz in love
'Tina is not in love with Fritz.'
- (ii) Tina ist in Fritz verliebt.
Tina is in Fritz in love
'Tina is in love with Fritz.'
- (iii) Inge ist nicht in Fritz verliebt.
Inge is not in Fritz in love
'Inge is not in love with Fritz.'

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- b. Er weiß, dass Tina nicht in ihn verliebt ist und betrinkt sich.
He knows that Tina not in him in love is and gets drunk himself
'He knows that Tina is not in love with him and gets drunk.'

For each of the five different triggers, twelve experimental items were created, yielding a total of 60 items. These were intermixed with 30 filler items. The filler items were designed parallel to the test items with regard to their acceptability. Crucially, they did not contain any PSP triggers.

Participants were seated comfortably in a sound-attenuated room. First, participants read a global context to familiarize themselves with the protagonists featured in the test sentences. After that, the trials began. Every trial began with a warning signal followed by a context sentence. After reading the context sentence, participants pressed a button to request the test sentence. The test sentence was presented word by word in a self-paced manner. After reading the context and the test sentence, participants were asked to rate the acceptability of the test sentence within the given context on a scale from 1 (very bad) to 4 (very good).

The design was within participants and the stimulus material was divided randomly into three parts. Each participant had to come in three times and do one of the three sessions on a different day. At the end of each session, twenty out of sixty yes/no comprehension questions (e.g., 'Did Tina buy blue gloves?') were asked to make sure that participants paid ample attention during reading.

The data from 24 native speakers of German (21 women; mean age = 25.33; age range = 19-29) were collected. All of them were from the University of Tübingen community. They all had normal or corrected to normal vision.

3.4.2 Predictions

The discussion in the last section has already made clear that the theories of Simons (2001) and Abrusán (2011) deviate from a purely semantic view of PSPs. Here I will hypothesize how these differences could translate into processing.

The Pragmatic View The main claim of Simons (2001) and Abrusán (2011) is that the PSPs of factives and change of state verbs are not encoded in the respective lexical entries but arise by some kind of pragmatic reasoning. The most straightforward prediction that can thus be drawn from these theories is that *know* and *stop* should

3.4 Experiment: *Weider* and Other Triggers

differ from *again*, *too*, and the definite determiner. How could this difference look like? Even though both Abrusán and Simons remain for the greater part agnostic about other PSP triggers, they seem to consider a conventional source for the PSPs of *again* and *too* at least, and possibly for the definite, too. In the psycholinguistic literature on the processing of (scalar) implicatures, many authors have argued that the pragmatic strengthening of *some* to *some and not all* is delayed relative to the literal interpretation of *some* as *some and possibly all* (cf. Bott and Noveck (2004), Breheny et al. (2006), Huang and Snedeker (2009)). If we take these results at face value, we might expect that effects in sentences with pragmatic presuppositions arise later than effects in sentences with semantic presupposition triggers. We have seen in the previous chapter that an unmet PSP leads to immediate processing effects in the case of *again*. This makes sense if we assume the PSP to be part of the lexical entry of *again* which directly goes into the compositional sentence interpretation. As soon as the content of the PSP is known, it is checked whether the context set entails the relevant information. If pragmatic reasoning is considered later than semantic information, we would expect to find a delayed effect of presupposition failure for sentences with *stop* and *know* in contrast to sentences with *again*, *too*, and the definite determiner. However, the debate of whether pragmatic phenomena give rise to delayed effects is by no means settled in the psycholinguistic literature, as various authors have presented evidence for rapid implicature computation (Grodner et al. (2010), Breheny et al. (2013)). It is thus not clear whether a difference in the timing with which an effect arises can be expected between the two kinds of presuppositions (‘pragmatic’ and ‘semantic’). If, however, there is difference between the individual triggers, a pragmatic theory as presented here, would predict that *again* patterns with *too*, and presumably the definite determiner, whereas *stop* should show a parallel processing pattern to *know*. The pragmatic theories discussed here remain silent about what happens when a PSP is not in the common ground versus when it is explicitly known that the PSP is not true. As a simplification I will therefore treat the neutral and the negative condition of the present experiment on par.

The Semantic View With the picture I laid out above, the predictions about processing that can be drawn from a semantics-only perspective are pretty straight forward: *Too* should show a similar processing pattern like *again*, *know* should pattern with the

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definite and *stop* should be processed differently from all the other triggers. Let us look at the predictions in turn. I am assuming that *too* should pattern with *again* because they are both Class One triggers whose PSP will not be accommodated. Additionally, they both introduce a free variable at the level of PSP. It has to be kept in mind, however, that *again* introduces a free variable over times whereas *too* introduces one over individuals. This might be a source for potential differences. But for the moment, I will assume that both triggers will evoke a similar processing pattern. As we have seen in the last chapter, effects due to an unfulfilled PSP occur as soon as the content of the PSP is known, i.e. the critical word. Again, I will assume that the negative condition is similar to the neutral condition in this respect. Yet it might well be that the negative condition patterns more with the positive condition because both conditions are very explicit about whether the PSP holds or not.

In the case of *too* and *again*, there should be an increase of reading times in the negative and the neutral condition relative to the positive condition. Since the negative condition prohibits accommodation and I have argued that there is no accommodation in the neutral condition, the free variable introduced by the trigger will only play a role in the positive condition. Therefore, I expect longer reading times in the positive condition at a later point in the sentence. Figure 3.1 provides a possible processing pattern.

The trigger *stop* is an especially interesting case. Remember that I have argued that *stop* belongs to the Class Two triggers whose PSP has to be interpreted (and if necessary accommodated) immediately due to the semantic impact of these triggers. This fact might have interesting consequences for the interpretation of the free temporal variable that *stop* introduces into the computation. Since *stop* has an impact on the assertion, there might be a bigger pressure to assign a value to the free variable as soon as possible than in the case of *too* and *again* in order to proceed with the compositional interpretation. Thus, we might expect an increase in reading times in the positive condition early on as well. Additionally, I predict that in the neutral condition, the PSP of *stop* has to be accommodated. This could be reflected in either even higher reading times on the critical word, or in higher reading times that spread over a number of words. The hypothesis laid out here is depicted in Figure 3.2.

The processing pattern of *know* and the definite determiner should be similar to the one of *stop*. The only difference between these two types of triggers is that *know*

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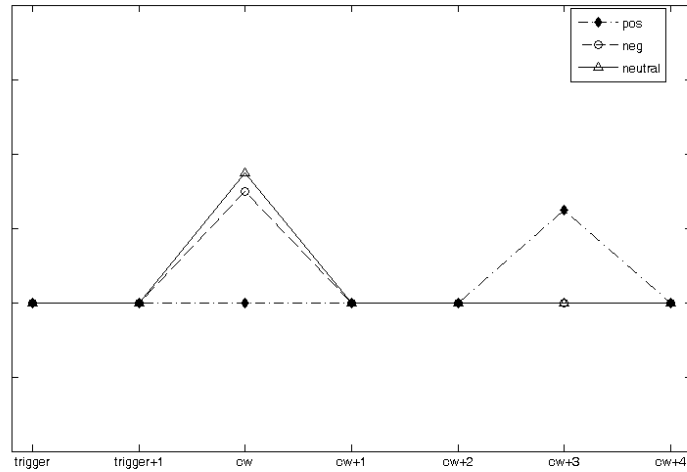


Figure 3.1: Semantic Processing Hypothesis for *again* and *too* - Early Processing of PSP failure, late effect in the positive condition

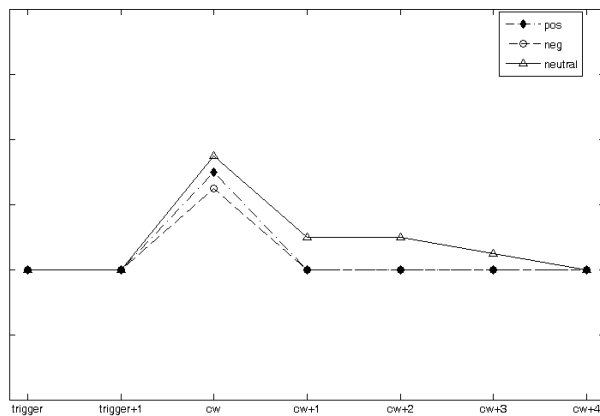


Figure 3.2: Semantic Processing Hypothesis for *stop* - Early Processing of PSP failure and in the positive condition, accommodation in the neutral condition

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and the definite do not introduce a free variable of any kind. Thus, there should be no increase in reading times in the positive condition. However, since they both belong to the class of triggers whose PSP has to be accommodated, there should be an extra effort in the neutral condition as well. Figure 3.4.2 captures this hypothesis.

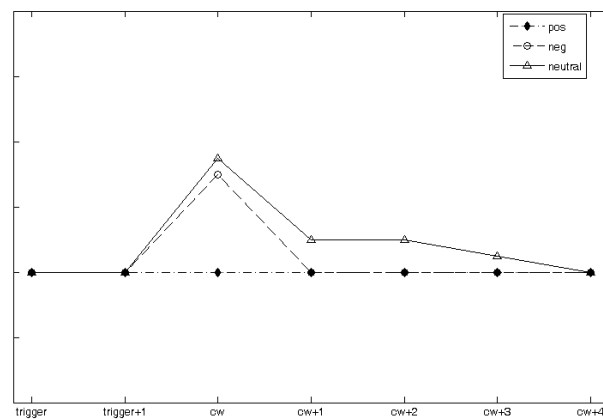


Figure 3.3: Semantic Processing Hypothesis for *know* and the definite determiner - Early Processing of PSP failure, accommodation in the neutral condition

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Summary Table 3.1 provides a short summary of the hypotheses laid out above. The main differences lie in how the triggers cluster. Both theories expect *too* and *again* to behave in a parallel fashion. Yet, the pragmatic theories presumably predict the definite to pattern with the aforementioned triggers, while the semantic theory treats it more on par with *know*. According to the pragmatic theories, however, *know* and *stop* should be processed in a alike. On the semantic account, *stop* has a special status and is thus predicted to be processed differently from the other triggers.

Pragmatic Theories	Semantic Theory
<i>too</i> , <i>again</i> and definite : early PSP failure effects	<i>too</i> and <i>again</i> : early PSP failure effects, late effects in positive condition
	<i>stop</i> : early PSP failure effects, early effects in positive condition and possibly accommodation in neutral condition
<i>know</i> and <i>stop</i> : possibly later PSP failure effects	<i>know</i> and definite : early PSP failure effects and possibly accommodation in neutral condition

Table 3.1: Processing Predictions derived from a Pragmatic and a Semantic Theory of PSPs

The results of the experiment presented in Domaneschi et al. (2013) which I have discussed in the last chapter seem to support the predictions made by the semantic view. The authors present an offline study on the accommodation of PSPs introduced by different triggers. The results are such that the PSP of the definite and factive verbs are accommodated most of the time whereas this is much less the case for PSPs evoked by iteratives and focus sensitive particles like *too* and *even*. Change of state verbs constitute a middle of the road case in that they pattern with the definite and factive verbs under ‘normal’ conditions. However, as soon as the cognitive load increases, accommodation in the case of change of state verbs decreases. The same holds true for iteratives. This decrease in accommodation as soon as cognitive load is increased can be linked to the temporal variable which both triggers introduce. The present experiment,

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in contrast to the one in Domaneschi et al. (2013), tests whether such a pattern can also be detected in the online processing of sentences with the above mentioned triggers.

3.4.3 Results

Analyses were carried out using the R programming language (R Development Core Team) as linear mixed models, using the program *lmer* (Bates, 2005). The fixed factor was **context** (neutral / negative / positive). The random factors were subjects and items. Additionally, models with random slopes for both subjects and items were calculated. When an ANOVA revealed a significant difference between the models, the more complex model was chosen. Trials which deviated more than 3 SDs from the mean were deleted. This affected 2% of the data in total.

As for the comprehension questions, everyone answered over 75 % of the 60 questions correctly ($M = 88.1\%$; $Min = 83.3\%$, $Max = 95\%$). This suggests that participants paid ample attention and read the sentences carefully.

3.4.3.1 Acceptability Ratings

For all triggers except the definite determiner, sentences in the positive context received the highest and sentences in the negative context the lowest rating. Table 3.2 sums up the mean ratings for all triggers in all contexts. In the case of the definite determiner, sentences in a neutral context were rated as least acceptable. The differences between the individual conditions were significant for all triggers (all $p > .05$) with the exception of the difference neutral - negative context in the case of the definite determiner.

context	<i>too</i>	<i>again</i>	<i>stop</i>	<i>know</i>	def. det.
positive	3.7	3.4	3.8	3.8	3.8
negative	1.3	1.6	1.3	1.2	2.2
neutral	1.7	2.4	2.4	2.3	1.8

Table 3.2: Acceptability judgments for all triggers on a scale from 1 (very bad) - 4 (very good)

3.4.3.2 Reading Times

For the reading times, I will focus on the following regions: the trigger, one word after the trigger, the critical word (i.e. the word at which the PSP is fully known), one word after the critical word, two words after the critical word, the word preceding the final word, and the final word of the sentence. Below I present the reading time data for each PSP trigger individually.

Too The absolute reading times for a sentence containing *too* in all three conditions is given in Table 3.3. On the word after the trigger (*Susanne* in (19-b)), there is a significant reading time difference between the positive and the negative condition with the sentence in the negative context being read faster than in the positive context ($|t| = 2.715$, $p < .001$). The positive and the neutral condition deviate significantly on the critical word (*kocht* in the example above) where the sentence in the positive condition is read faster than the sentence in the neutral condition ($|t| = 2.053$, $p < .05$). The second to last and the last word of the sentence (*dafür Zutaten* in (19-b)) are read significantly faster in the negative condition than in the positive condition ($|t| = 2.550$, $p < .05$ and $|t| = 2.132$, $p < .05$ respectively). All other differences were statistically not significant. Figure 3.4 depicts the reading times for the relevant words.

context	trigger	trigger+1	critical word	cw+1	cw+2	lw-1	last word
	<i>auch</i>	<i>eine</i>	<i>kocht</i>	<i>und</i>	<i>kauft</i>	<i>dafür</i>	<i>Zutaten</i>
positive	320	332	331	334	320	325	339
negative	308	310	322	320	310	306	323
neutral	316	315	349	329	328	322	332

Table 3.3: Reading times for sentences with *too* in ms

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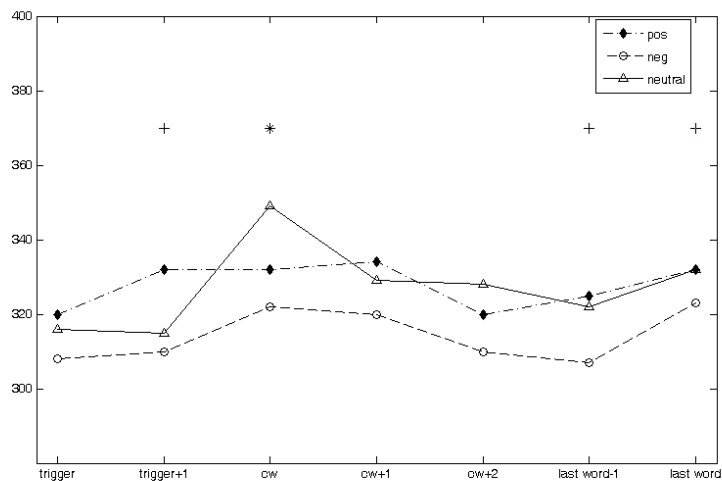


Figure 3.4: Reading times in ms for sentences with *too* - Asterisks mark significant difference between **positive** and **neutral** condition, crosses mark significant difference between **positive** and **negative** condition, both at the $p < .05$ threshold

Again For sentences with *again*, the absolute reading times are given in Table 3.4. Significant differences emerged on the trigger between the neutral and the positive condition with the sentence in a positive context being read faster than in a neutral context ($|t| = 3.243$, $p < .001$). There were no other significant differences. However, as can be gathered from Figure 3.5, the absolute reading times on the final word were slower in the positive condition than in the neutral and the negative condition.

context	trigger	trigger+1	critical word	cw+1	cw+2	lw-1	last word
	<i>wieder</i>	<i>rote</i>	<i>gekauft</i>	<i>und</i>	<i>sie</i>	<i>gleich</i>	<i>angezogen</i>
positive	314	317	340	329	323	326	353
negative	317	313	336	331	321	317	338
neutral	342	321	334	333	321	321	337

Table 3.4: Reading times for sentences with *again* in ms

3.4 Experiment: *Weider* and Other Triggers

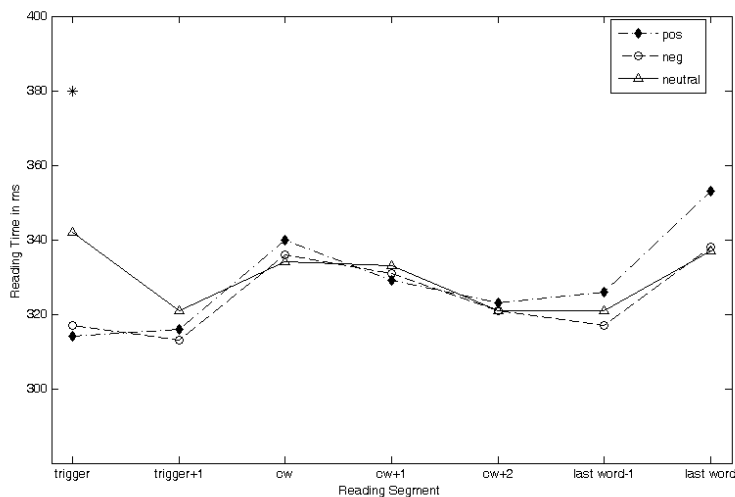


Figure 3.5: Reading times in ms for sentences with *again* - Asterisks mark significant difference between **positive** and **neutral** condition at the $p < .05$ threshold

Stop Table 3.5 presents the reading times for sentences with *stop* in all three conditions. A significant difference emerged on the critical word (*auszuhelfen* in (20-b)) between the positive and the neutral condition. Here, sentences in a neutral context were read significantly faster than sentences in a positive context ($|t| = 2.714, p < .01$).

context	trigger	trigger+1	critical word	cw+1	cw+2	lw-1	last word
	<i>aufhören</i>	<i>in</i>	<i>auszuhelfen</i>	<i>und</i>	<i>teilt</i>	<i>Vorgesetzten</i>	<i>mit</i>
positive	324	326	364	330	318	347	343
negative	320	319	342	327	314	328	345
neutral	325	325	331	325	316	334	335

Table 3.5: Reading times for sentences with *stop* in ms

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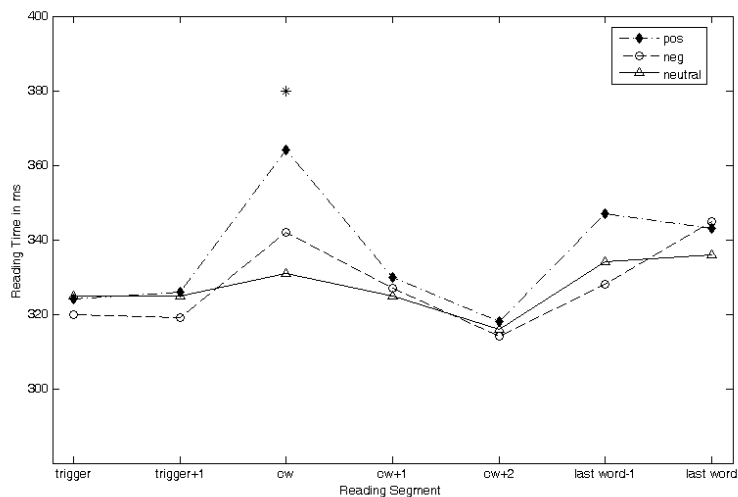


Figure 3.6: Reading times in ms for sentences with *stop* - Asterisks mark significant difference between **positive** and **neutral** condition at the $p < .05$ threshold

Know For sentences with *know*, a significant difference in reading times emerged on the critical word (*verliebt* in (22-b)). Here, the sentence in the neutral condition evoked longer reading times than the sentence in the positive condition ($|t| = 3.557, p < .001$). This difference remained significant on the succeeding word (*ist* in the example above; $|t| = 2.303, p < .05$). The absolute reading times are given in Table 3.6 and illustrated in Figure 3.7.

context	trigger	trigger+1	critical word	cw+1	cw+2	lw-1	last word
	<i>weiß</i>	<i>dass</i>	<i>verliebt</i>	<i>ist</i>	<i>und</i>	<i>betrinkt</i>	<i>sich</i>
positive	340	317	314	319	307	317	346
negative	332	308	331	324	311	308	329
neutral	329	316	348	341	319	322	349

Table 3.6: Reading times for sentences with *know* in ms

3.4 Experiment: *Weider* and Other Triggers

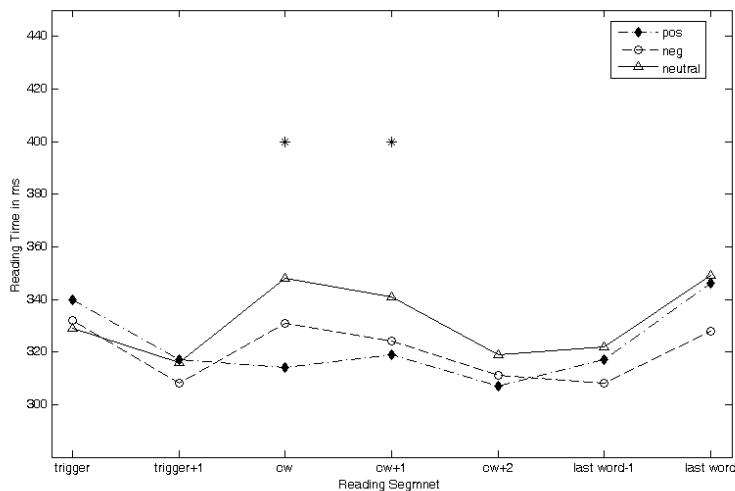


Figure 3.7: Reading times in ms for sentences with *know* - Asterisks mark significant difference between **positive** and **neutral** condition at the $p < .05$ threshold

Definite Determiner For sentences with the definite determiner, the reading time data are presented in Table 3.7. There were significant differences between the positive and the neutral condition on the trigger and on the noun after the trigger, i.e. the critical word. For both regions, reading times were longer in the neutral than in the positive condition ($|t| = 2.536$, $p < .05$ and $|t| = 2.441$, $p < .05$ respectively). Figure 3.8 on the next page depicts the reading times on the relevant segments.

context	trigger	critical word	cw+1	cw+2	lw-1	last word
	<i>sein</i>	<i>Taxi</i>	<i>und</i>	<i>fährt</i>	<i>nach</i>	<i>Potsdam</i>
positive	320	348	337	330	323	340
negative	329	358	354	348	330	346
neutral	338	379	350	329	327	340

Table 3.7: Reading times for sentences with the definite determiner in ms

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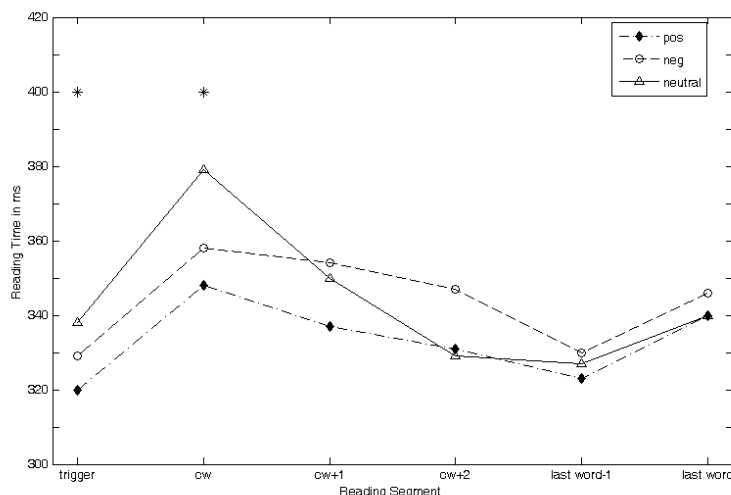


Figure 3.8: Reading times in ms for sentences with the definite determiner
- Asterisks mark significant difference between **positive** and **neutral** condition, crosses mark significant difference between **positive** and **negative** condition, both at the $p < .05$ threshold

3.5 Discussion

In this experiment I have looked at how different contexts influence the processing of a sentence with a PSP. I have done so for a wide variety of triggers. One thing that is apparent on first glance is that for all triggers, processing differences between the positive and the neutral condition arose early in the sentence. For most triggers, reading times came apart as soon as the full content of the PSP was revealed (i.e. the critical word). For *again* and the definite determiner, reading times differed already on the trigger itself. Below I will discuss the possible source of these early effects. However, if we assume that all these effects are caused by the missing PSP, we can say that these effects appear very early and not, for example, towards the end of the sentence. Crucially, *stop* and *know* are not different from *again*, *too* and the definite determiner, i.e. they do not exhibit any late effects. Yet, *stop* is very different from all the other triggers in that the reading times on the critical word are the highest in the positive condition and the lowest in the neutral condition. I will discuss the details of this result below.

At first blush, the results are more in line with the semantic than the pragmatic

view. In the following section I will discuss the results for each trigger in turn to get a better handle on the results. In what is to follow, I will focus on the neutral and the positive condition exclusively. Even though there was a slight increase in reading times in the negative condition in most cases, it never reached significance in comparison to the positive condition. I will thus concur with Tiemann et al. (2011) that PSP processing in the negative condition is less demanding because the context is already very explicit about the PSP (that it is false). It is thus very likely that the facilitation in the negative contexts was promoted by the inclusion of the neutral condition, in which the processor has to decide how to deal with the unmet PSP. This is a crucial difference between the experiment discussed here and the experiment presented in Schwarz and Tiemann (2012), where a falsified PSP resulted in processing costs in an experiment using eye tracking. In contrast to the present experiment, there was no neutral context and thus the condition in which the PSP was falsified, was the most marked. In the discussion to follow, I will offer an explanation for how the different processing strategies might look like for each trigger in turn.

3.5.1 Discussion of the individual results

Too For sentences with *too*, the only significant difference between the neutral and the positive condition emerged on the critical word. Here, sentences in the neutral condition were read longer than sentences in the positive condition. This means that comprehenders processed the PSP of *too* as soon as the full content of the PSP was revealed. This confirms the results in Schwarz (2007), that sentences in which the PSP of *too* is not satisfied, exhibit longer reading times. However, it also extends on the findings in Schwarz (2007), in that it gives us a more precise understanding of when the relevant effect emerges. In his experiment, Schwarz analyzed the whole clause containing the PSP trigger as one region of interest. It is thus not clear when the observed effect arises. The present experiment shows clearly that the difference arises as soon as the whole PSP content is evident to the reader. This means on the one hand, that the PSP is processed as soon as it can be calculated, but on the other hand, that people do not forecast what the content of the PSP might be.¹

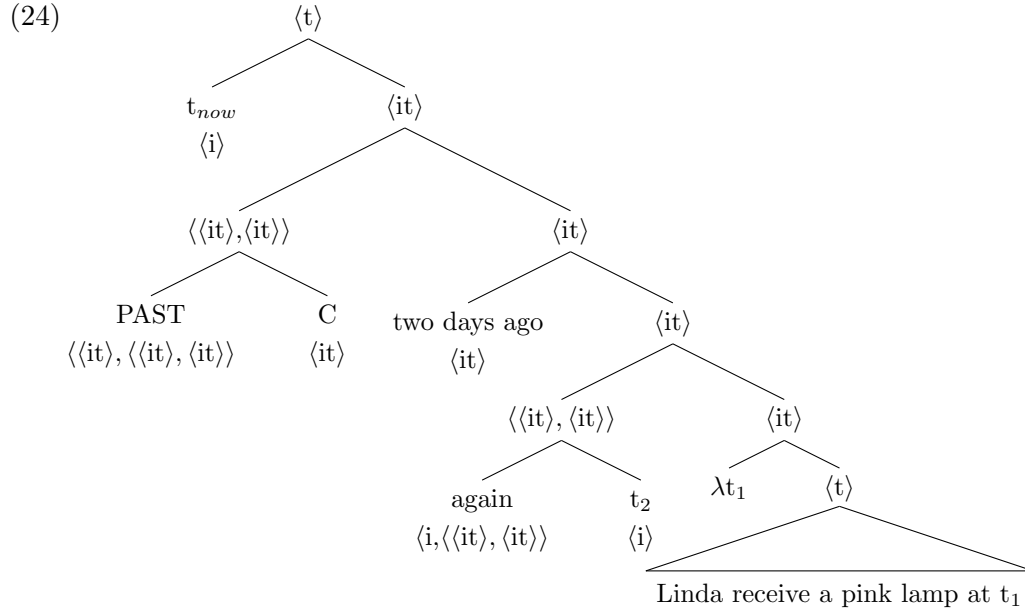
¹The results for *again* and the definite will show that comprehenders make early predictions about what the PSP will be when they have enough independent evidence to do so. See chapter 5 for a processing model which captures this predictive processing.

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Concerning the predictions discussed above, there is no point during processing at which the positive condition resulted in longer reading times than the neutral condition. Based on the findings for *again* in the last experiment, I hypothesized that a similar effect (positive harder than neutral condition) might occur in sentences with *too*. I argued that the late effect for sentences with *again* is due to the value assignment for the free temporal variable that *again* introduces. Since *too* also introduces a variable which ends up free in the derivation, I assumed that a similar effect might occur. However, the results of this experiment seem to suggest otherwise. One obvious difference between *again* and *too* is that the former requires a temporal reference whereas the latter requires reference to an individual. When we hear a sentence like (23-b) in a context like (23-a), we can readily assign a value to the free variable introduced by *too*, namely the individual named Fritz.

- (23) a. Fritz kocht heute eine Suppe mit Tina.
Fritz is cooking today a soup with Tina
'Fritz is cooking soup with Tina today.'
- b. Sie hofft, dass auch Susanne eine Suppe mit ihr kocht und kauft dafür
She hopes that too Susanne a soup with her cooks and buys for it
Zutaten.
ingredients
'She hopes that Susanne will cook a soup with her, too, and shops ingredients for it.'

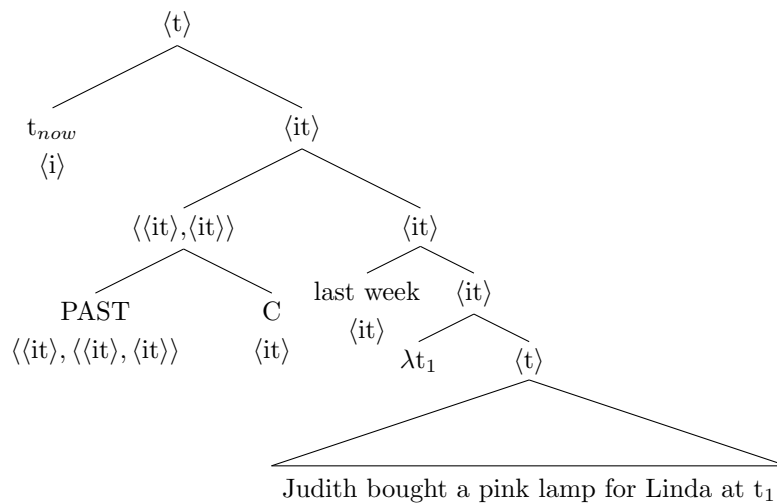
In the case of the temporal variable, variable assignment is much more abstract. In (24) I repeat the Logical Form for a sentence with *again* from the last chapter. The outcome of the compositional computation is (25-a) which is only defined if the PSP in (25-b) is met.



- (25) a. $\exists t'[C(t') \ \& \ t' < t_{now} \ \& \ receive(t')(pink \ lamp)(Linda) \ \& \ t' \subseteq two\text{-}days\text{-}ago]$
 b. $\exists t[C(t') \ \& \ t_2 < t' \ \& \ receive(t_2)(pink \ lamp)(Linda)]$

The crucial question is where t_2 in (25-b) receives its value from. In the end, it will receive its value from the existentially bound variable introduced by the PAST operator in the context sentence in (26), i.e. t in (26-c).

- (26) a. Last week, Judith bought a pink lamp for Linda.
 b.



- c. $\exists t[C(t) \ \& \ t < t_{now} \ \& \ buy(t)(pink \ lamp)(Linda)(Judith) \ \& \ t \subseteq last \ week]$

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Conceptually, the resolution of the temporal variable seems to be a much more complicated process than in the case of an individual variable. For one thing, the individual variable receives its value from something that has been overtly mentioned in the context, whereas this is not possible for the temporal variable because its antecedent is phonologically silent. For another thing, the entity which the individual variable refers to is very well defined (the human being named Fritz), while the temporal variable refers to some time interval of which we only know that (i) it precedes the present time and (ii) it is a subset of *last week*. The fact that sentences with *too* in the positive condition do not impose the same difficulty that sentence with *again* do, can thus be explained by the different kinds of reference that have to be made in the two cases. This, however, presupposes an analysis of tense in the sense of von Stechow (2009).

There is, however, the possibility that *too* presuppositions is about times rather than individuals. Sigrid Beck (p.c.) suggested that it might be interesting to examine the processing of sentences like (27) in order to test the analysis outlined above.

- (27) a. Hans war letztes Jahr in Schottland.
Hans was last year in Scotland
- b. Dieses Jahr war er AUCH in Schottland.
This year was he ALSO in Scotland

In the example sentence in (27), the PSP of (27-b) is about another time at which Hans went to Scotland. If my hypothesis that the resolution of a free time variable is harder than the one of a free individual variable is borne out, we would expect that the variable assignment in (27-b) results in additional processing effort. This idea should be followed up in a next step.

Again The only significant difference for sentences with *again* emerges on the trigger between the positive and the neutral condition. The early effect is probably due to the way the context sentences were created. All of them were parallel to the example in (18-a), repeated in (28-a).

- (28) a. (i) Susanne hat bereits rote Handschuhe gekauft.
Susanne had already red gloves bought.
'Susanne had bought red gloves before.'

-
- (ii) Susanne hat bisher nie rote Handschuhe gekauft.
 Susanne had until now never red gloves bought.
 ‘Susanne had never bought red gloves until now.’
- (iii) Inge hat bisher nie rote Handschuhe gekauft.
 Inge had until now never red gloves bought.
 ‘Inge had never bought red gloves until now.’
- b. Heute hat Susanne wieder rote Handschuhe gekauft und sie
 Today has Susanne again red gloves bought and them
 gleich angezogen.
 immediately put on
 ‘Today, Susanne bought red gloves again and put them on right away.’

The neutral context was always about someone other than the target sentence. Thus, at the point the participants encountered *wieder* in the target sentence, it was obvious that the PSP of *wieder* was not given in the context, no matter what the continuation of the sentence might look like. This explains why the reading times came apart on the trigger already. Consequently, since people had already dealt with the missing PSP by then, there is no effect on the critical word. This finding is really interesting because it goes to show that the semantic processor can compute meaning components even in advance if it has enough evidence to do so. At the time it encounters *wieder* in (28), it only knows that x must have done something prior to *today*. As many studies on subject-object ambiguities have shown (e.g. Bader and Meng (1999); Schlewsky et al. (2000); Schlewsky and Friederici (2003)), the first noun in a sentence is always assigned the role of the subject. Thus, the processor also knows that x=*Susanne*. However, since there is no information about *Susanne* in the immediate context, the PSP cannot be fulfilled no matter what. As soon as this is apparent to the processor, a conflict arises. The fact that this happens immediately on the PSP trigger suggests that the trigger initiates this process. This is most easily accounted for if we assume the PSP to be part of the lexical meaning of the trigger, as suggested by a semantic theory of PSPs.

There are no further significant effects for sentences with *wieder*. However, by looking at the absolute reading times, we can see that there is an increase in reading times in the positive condition on the very last word. This increase is very reminiscent of the inflated late reading times in the positive condition in the experiment presented in the last chapter. The fact that the difference in this experiment is not significant

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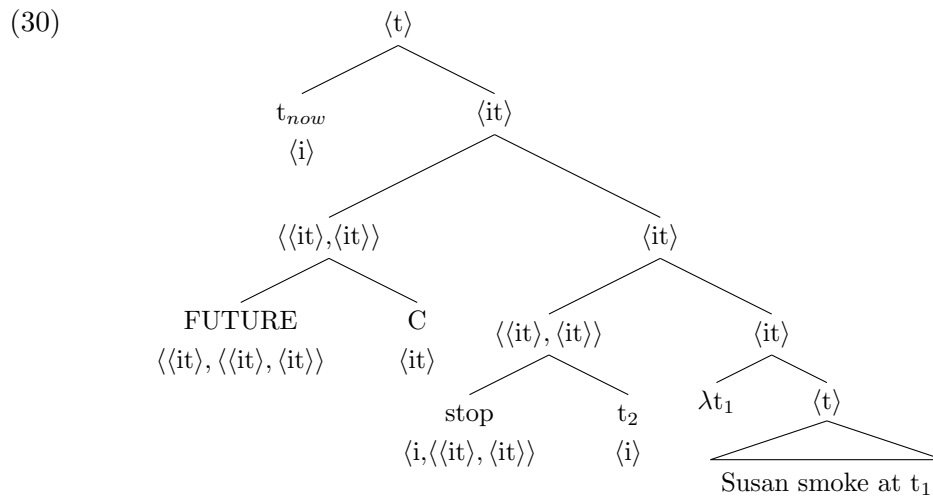
might be due to a lack of data. In the previous experiment, 16 participants read 40 experimental items, which equals 640 data points per condition. In this experiment, 24 participants read 12 sentences (per trigger), yielding a total of 288 data points. This might be a reason why the effect in this experiment is not significant yet. Additionally, the relevant difference emerges on the last word of the sentence, the point at which sentence wrap-up effects take place (cf. Just and Carpenter (1980)). We can see that there is also a slight increase (although not as dramatic) in the neutral and in the negative condition. Thus, the effect might have been lost in the midsts of it all. Having said that, I assume that the process of assigning a value to the free time variable is what is behind the increase of reading times in the positive condition in the present experiment as well.

Stop The processing pattern of sentences with *to stop* is remarkably different from all the other triggers used in the present experiment. There is also a significant effect on the critical word, but in the opposite direction of what we have seen so far. In the case of *stop*, reading times in the positive condition are much longer on the critical word than in the neutral condition. The acceptability judgment data shows that this increase in reading times has nothing to do with the acceptability of the sentences. Test sentences in the positive condition were rated fully acceptable (3.8) whereas sentences in the neutral condition were rated somewhere mid-way (2.4). In fact, the acceptability pattern is almost the same as for *know* (3.8 and 2.3, respectively). Yet, the reading time data is remarkably different. This is the first interesting observation: Even though two constructions might be judged similarly in offline measures, substantial differences can be revealed by the online data. In other words, while a classification of triggers on the basis of the acceptability data alone might have put *stop* and *know* in the same category, it is the reading time data which unveils the underlying differences between the two.

The reading time pattern in the positive condition closely resembles the processing predictions made by a semantic theory laid out above. As predicted, there is an increase in reading times on the critical word. The rationale I discussed in the predictions section was that - just like in sentences with *again* - the free time variable introduced by *stop* has to be assigned a value from the context in the positive condition. The previous experiment on *again* showed that this is an costly process which results in

inflated reading times. In sentences with *again*, this effect only showed up two words after the critical word. For *stop*, reading times increase immediately on the critical word. I have argued in the last chapter that the interpretation of *wieder* - or *again* for that matter - is a two step process. In a first step, the PSP introduced by *again* is checked against the context. If the context does not provide the relevant background information, the trigger is ignored. If the context is such that it furnishes the right proposition, the second step kicks in. This is the point at which the free time variable receives an appropriate value via the variable assignment function. Here I will suggest that the same process underlies the interpretation of *stop*. However, in the case of *stop*, there is no option to ignore the trigger, because this would have a major impact on the assertion, as I have discussed in the previous chapter. Instead, the only option to remedy an unfulfilled PSP is via accommodation. Thus, no matter what the context provides, the compositional output of (30) will always be (31).¹

(29) Susan will stop smoking.



(31) $\exists t' [C(t') \ \& \ t' > t_{now} \ \& \ smoke(t')(Susan)]$
PSP: $\exists t' [C(t') \ \& \ t < t' \ \& \ smoke(t)(Susan)]$

The fact that *stop* adds a semantic contribution to the assertion (namely that the negation of the embedded proposition is true) and is thus a vital part in the compositional interpretation, puts pressure on the processor to interpret all the relevant information

¹I am using future tense here since this was also used in the experimental items. I am assuming a simplified version of the meaning of FUTURE. As before, I am assuming existential projection.

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as soon as possible. This is different from sentences with *again*. The only crucial step here is to check whether the PSP is given in a context or not, but the second step in the proposed interpretation schema can be delayed to a later time.

For *stop*, as soon as the embedded proposition is known (*Susan smoke* in the example above), it will be combined with *stop*. If the PSP of *stop* is fulfilled, a value is assigned to the time variable immediately. When the PSP is not fulfilled, it has to be accommodated. Since this is a last resort operation, it would be ineffective of the processor to accommodate a PSP with a free value which then would have to be assigned a value in a next step. This is ineffective first because it is already clear that the context does not furnish an appropriate value and second because it would add a highly superfluous processing step. I will thus assume that the accommodated PSP will be existential (as in (32) for a sentence like (30)) rather than referential. But how does this existential PSP come about? In the lexical entry for *stop* assumed in this thesis, there is no binder for the first temporal argument of *stop*. And it would be highly undesirable to assume that lexical entries can be revised on the fly. I will rather assume that the free time variable will undergo existential closure (cf. Heim (1982)).

(32) **accommodated PSP:** $\exists t \exists t' [C(t) \ \& \ t < t' \ \& \ smoke(t)(Susan)]$

However, there is something remarkable about the reading time pattern of sentences containing *stop* in the neutral condition. The reading times on the critical word are not only significantly shorter in the neutral condition than in the positive condition, they are also shorter than the reading times in the negative condition. It seems as if the unmet PSP and the resulting accommodation process do not have any impact on the reading times at all. This is very peculiar since I have assumed above that accommodation is a costly process which should be reflected in reading times. For the moment, all I can do is to conclude that there is an effect of PSP failure in the neutral condition which we do not see. However, this result can also be taken to suggest that accommodation is not such a complicated task for the processor after all. The appearance of *stop* signals that its PSP has to be dealt with and this might put comprehenders already in “accommodation-mode”. Thus, as soon as the PSP cannot be found in the context, it will be put there without a lot of effort. This assumption gains extra support from the result that absolute reading times for sentences in the negative condition were also longer on the critical word than in the neutral condition. If comprehenders are already in the

verify-or-accommodate mode after reading *stop*, they face a serious problem once they find out that the PSP cannot be accommodated because it had been explicitly falsified previously. Even though the difference between the neutral and the negative condition at this point is not significant, there is a clear increase in reading times in the negative condition, reflecting the experienced difficulty. At this point in the negative condition, the sentence can only end up undefined, because no repair-mechanism (accommodation or ignoring the trigger) can save it. In the neutral condition, on the other hand, accommodation can proceed smoothly and does not disrupt the processing extensively. It has to be noted that this pattern looks a little bit different for each trigger. Hence there might be differences in how easily a PSP is accommodated after all. This is something that future research will have to look into in more detail.

Know In sentences with *know*, repeated in (33), reading times differ significantly between the neutral and the positive condition on the critical word (*verliebt* in the given example) and the word after that (*ist*).

- (33) Er weiß, dass Tina nicht in ihn verliebt ist und betrinkt sich.
 He knows that Tina not in him in love is and gets drunk himself
 ‘He knows that Tina is not in love with him and gets drunk.’

Technically, *ist* (“be”) belongs to the VP which reveals the PSP fully, but since it does not add anything except from adding temporal information, I take the preceding word to be the critical word.¹ The result that the effect between the neutral and the positive condition spreads over these two words might have two possible sources. First, the long-lasting effect could be due to accommodation. In this scenario, the initial effect on the critical word is caused by the missing PSP in the neutral condition. Remember that, according to the semantic hypothesis about different triggers presented here, *know* belongs to the class of triggers whose PSP has to be accommodated. Therefore, the persistence of the reading time difference on the word following the critical word might reflect this process. Another explanation might be that the long-lasting effect is caused by inter-reader variation. I have argued above that *verliebt* is the critical word, even though the verb *ist* completes the phrase. It is conceivable that there are readers who

¹All sentences with *know* were set up in this fashion.

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calculate the PSP on the participle and others who delay this task until they encounter the tensed verb.

In order to discriminate between the two possible explanations for the prolonged reading time difference, a post-hoc analysis was performed. Subjects who read the adjective (*verliebt*) slower than the verb were put in a group different from those who did not. This resulted in 12 subjects per group. The idea is that if there is a difference between readers (parallel to the difference between “energetic” and “lazy” readers in Koornneef (2008)), the difference between conditions should arise on different words for the two groups. For those subjects who displayed longer reading times on the participle, the effect should only be present on *verliebt*, but not on *ist*. For the other group, the effect should show up the other way around (on *ist* and not on *verliebt*). If, however, the widespread effect is due to accommodation, there should be no difference between the two groups and the effect is expected to be present on both words. The analysis reveals that there is an effect on the adjective for the first group, but not for the second ($|t| = 3.232, p < .001$ and $|t| = 1.581, p > .1$, respectively). On the tensed verb, the effect is present for the latter group, but not for the former ($|t| = 2.200, p < .05$ and $|t| = 0.994, p > .1$, respectively). This post-hoc analysis reveals that there is difference between different groups of readers which is parallel to what Koornneef (2008) found. In his experiment, energetic readers chose immediately between a bound and a free variable reading, whereas lazy readers delayed this decision until later in the sentence. The presented experiment suggests that there is a difference between readers who evaluate a PSP as soon as possible and readers who wait until the whole VP is processed. This finding has interesting implications for a semantic processing model. The results for *know* obtained here and the experiment presented in Koornneef (2008) make clear that the question of how big a processing increment is cannot receive a general answer but can only be properly investigated by taking differences between readers into account. Dividing readers into two groups, namely energetic and lazy readers, can serve as a first step in this direction. More precisely, the difference has to do with two different types of interpreters. Those who assign a meaning to a string of words as soon as possible and those who wait until a full phrase (here: VP) is completed.

Definite Determiner For sentences with the definite determiner, the first peculiar result is the relatively good rating in the falsifying condition in comparison to the

neutral condition (2.2 vs. 1.8 on a scale from 1 to 4). For all other triggers, the falsifying condition is rated as less acceptable than the neutral condition. For the definite determiner sentences, the order is reversed. In order to account for this result, we have to take a closer look at the items used. The negative context in the example item in (21-a-ii), repeated below, explicitly states that the existence PSP of the definite determiner does not hold.

- (34) Tinas Bruder hat kein Taxi.
 Tina’s brother has not a taxi
 ‘Tina’s brother doesn’t own a taxi.’

However, if we assume a lexical entry for the definite article as in (35), the PSP is not only that there exists an individual of which the predicate holds, but that this individual is also unique in the domain of discourse.

- (35) $\llbracket \text{the} \rrbracket = \lambda w. \lambda f_{\langle s, \langle e, t \rangle \rangle} : \exists! x [f(w)(x) = 1]. \iota y. f(w)(y)$

In order to test this PSP as well and to make the material less predictable, falsifying contexts which only negated the existence of a unique individual, such as (36-a), were included in the experiment.

- (36) a. Fritz hat mehrere Restaurants.
 Fritz has a couple of restaurants
 ‘Fritz owns a couple of restaurants.’
 b. Susanne geht in sein Restaurant und trifft dort Bekannte.
 Susanne goes in his restaurant and meets there friends
 ‘Susanne goes into his restaurant and meets some friends there.’

It is very likely that comprehenders find it easier to restrict a domain with several entities to one salient entity than to assume the existence of something that has been explicitly mentioned as non-existent. Thus, the relatively good ratings for sentences in the falsifying condition might be driven by contexts such as (36-a). The experimental items were such that they included seven contexts which falsified uniqueness and five which falsified existence. Splitting the items into these two groups reveals the acceptability pattern in Table 3.8 which clearly shows that the “falsified uniqueness” items are behind the good ratings in the falsifying condition. Sentences in contexts which falsified the existence PSP are clearly rated very bad and much worse than in

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the neutral condition.

context	uniqueness falsified	existence falsified
positive	3.8	3.8
negative	2.9	1.3
neutral	1.7	2.0

Table 3.8: Acceptability judgments on a scale from 1 (very bad) - 4 (very good)

However, the question remains why it yields a higher acceptability when the one PSP (uniqueness) is falsified than when the other PSP (existence) is negated. This can be reconciled if we assume implicit domain restriction (von Stechow, 1994). Quantifier domains can be easily restricted to a relevant subdomain. The second sentence in (37) (taken from von Stechow (1994)), for example, does not quantify over every individual in the world but is rather restricted to the people who went out for pizza last night.

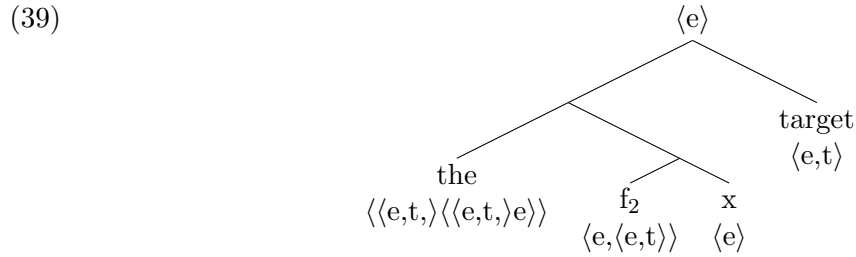
- (37) Some colleagues of mine and I went out for pizza last night. Everyone had a great time.

According to Martí (2003), every quantificational expression comes with an argument variable C which serves as a domain restriction. Martí cites Sigrid Beck (p.c.) as suggesting that this implicit variable is also present in the case of the definite determiner, as the example in (38) illustrates.

- (38) At a shooting range, each soldier was assigned a different target and had to shoot at it. At the end of the shooting we discovered that every soldier hit the target.

Even though it is not the case that there is only one unique target in the context, the use of the definite in (38) is appropriate. This can be explained if we assume that the definite determiner comes with an implicit domain pronoun which - like other pronouns - can be bound or free. In the example above, *every soldier* binds C . More precisely, C consists of two parts: A functor variable, which always remains free, and which takes another variable as its argument (see Martí (2003)). This variable is the one that gets bound by *every soldier*. The functor variable receives its value from the variable assignment function. In this example, f receives the value in (40). According

to this analysis, the definite article has to be amended to (41). This will yield the compositional output in (42) for (39).



(40) $g(2) = \lambda x \lambda y. \text{soldier}(x) \ \& \ \text{target}(y) \ \& \ x \text{ is assigned } y$

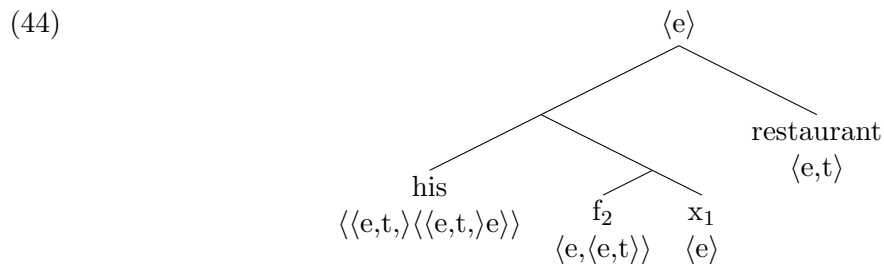
(41) $\llbracket \text{the} \rrbracket = \lambda f_{\langle e, t \rangle} . \lambda P_{\langle e, t \rangle} : \exists ! y [P(y) = 1 \ \& \ f(y) = 1] . \iota z . P(z) \ \& \ f(z)$

(42) $\iota z . \text{target}(z) \ \& \ \text{soldier}(x) \ \& \ x \text{ is assigned } z$

defined if: $\exists ! y [\text{target}(y) \ \& \ \text{soldier}(x) \ \& \ x \text{ is assigned } y]$

If we assume implicit domain restriction for the definite, we can account for the fact that participants rated sentences with an unmet uniqueness PSP better than sentences with an unmet existence PSP. When the uniqueness PSP fails, there is still the possibility to remedy the situation by restricting the functor variable of C in a suitable way. In a scenario like (43-a) taken from our experimental items, the restriction might look like (45). Here, C is free with the functional variable being the identity function and its argument a set of salient individuals (cf. Martí (2003)).

- (43) a. Fritz hat mehrere Restaurants.
 Fritz has a couple of restaurants
 ‘Fritz owns a couple of restaurants.’
- b. Susanne geht in sein Restaurant und trifft dort Bekannte.
 Susanne goes in his restaurant and meets there friends
 ‘Susanne goes into his restaurant and meets some friends there.’



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- (45) $g(2) = \lambda k_{\langle e, t \rangle} . k$
 $g(1) = \lambda x . x$ is salient

However, since this is an ad-hoc restriction and therefore an inferior move, ratings are still lower in sentences with an unmet uniqueness PSP than in sentence where both uniqueness and existence are satisfied.

As for reading times, in sentences with the definite determiner, they increased in the neutral condition on the definite determiner already. This results in a significant difference between the neutral and the positive condition ($|t| = 2.274, p > .05$). On the noun after the trigger (which is the critical word in this case), this difference is still significant ($|t| = 2.391, p > .05$). The early effect on the trigger is surprising considering that the full PSP is not yet known at that point. It becomes less surprising, however, if we take a look at how the neutral context was set up. For seven out of twelve items, the relevant object in the neutral context differed in gender and/or number from the noun in the definite NP in the target sentence. An example is given in (46).

- (46) a. Karl hat einen Pudel.
Karl has a_{masc.sing.} poodle
- b. Susanne streichelt seine Katzen und findet sie süß.
Susanne pets his_{fem.pl.} cats and finds them cute

The early effect on the determiner can thus be traced back to the fact that the unmet PSP could already be determined at this point, because there was no other noun in the context sentence which could have saved the PSP of *his* from failing.

As in the case of *know*, the interesting question is now why the effect appears on the trigger as well as on the noun. A first assumption might be that there is again a difference between energetic and lazy readers. If this was the case, the effect on the trigger could be driven by the energetic readers who calculate the PSP as soon as there is enough relevant information (in this case: number and gender features) to determine whether the PSP will end up satisfied or not, whereas the lazy reader delay this decision until they have the complete relevant information. In a post-hoc analysis I divided subjects who read the trigger in the neutral condition faster than in the positive condition (9 subjects) and subjects who exhibited the reverse reading time pattern (15 subjects) into two groups. On the trigger, there was a significant difference for the latter but not the former group. For the “slow on the trigger group”, reading times

on the trigger were significantly longer in the neutral than in the positive condition ($|t|=4.081$, $p < .001$), whereas this was not the case for the other group ($|t|=1.546$, $p > .1$). On the noun after the trigger (the critical word), the picture is the same. The “slow on the trigger” group read the noun significantly longer in the neutral than in the positive condition ($|t|=2.721$, $p < .01$), while there was no significant difference for the other group ($|t|=0.328$, $p > .1$). The effect on the trigger and the effect on the noun are thus driven by the “slow reading group” only. Hence there seems to be a difference between subjects who experienced (prolonged) difficulties when the PSP was not met and subjects who did not exhibit any processing costs in these cases. It is hard to say why there is no effect for the latter group. For the former group of subjects, however, the processing of the whole NP was significantly harder when the PSP was presented in a neutral context. I have discussed above that the results for *know* and *stop* suggest that accommodation does not lead to a more widespread effect in reading times (contra Tiemann et al. (2011)). The two effects on the trigger and the following might rather be due to the fact that the material was such that for some items the PSP mismatch could already be detected on the determiner (i.e. when gender and/or number of the entity in the context did not match), whereas in other target sentences, the unmet PSP became apparent only on the noun. This is interesting because it shows once more that the PSP is processed as early as possible. The processor does not need the whole NP when there are other clues (in this case: gender and number features on the determiner) which provide enough information about the PSP. This parallels the findings obtained for *wieder* in the present experiment.

3.6 Conclusion

This chapter set out with the question of how sentences with different triggers are processed, especially in contrast to sentences with *wieder*. On the basis of recent theoretical considerations, I contrasted two kinds of processing hypotheses: One motivated by pragmatic reasoning as presented in e.g. Simons (2001) and Abrusán (2011) and a purely semantic view in a Heim and Kratzer (1998) framework, supplemented with the maxim of *Minimize Accommodation* postulated in the last chapter. The hypotheses were such that according to the pragmatic theories, *wieder*, *too* and the definite article

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were expected to cluster together, as well as *know* and *stop*. The semantic theory predicted *too* and *again* to show a similar processing behavior, and *know* and the definite to belong to one class. The change of stat verb *stop* was expected to be processed differently from all other triggers.

The results of the present experiment mostly confirm the processing predictions made on the basis of the semantic theory. Possibly the most striking result is that sentences with *stop* exhibit a considerably different processing pattern from all other sentences. This is only accounted for if we take the semantic contribution of *stop* seriously. Even though the acceptability judgment data for *stop* and *know* is almost the same, there is no obvious way in which a pragmatic view of things can explain the difference in reading times. The conclusion is thus that a semantic theory of PSPs fits the empirical picture better.

The experiment brought to light several other interesting insights, some of which are surprising from a semantic perspective as well. The first one concerns the missing increase in the positive condition in sentences with *too*. I discussed in the predictions, how I expected *too* to exhibit a parallel reading time pattern to *again*, because both introduce a variable which has to be assigned a value from context. The reading time data for *again* obtained in this experiment suggestively replicates the findings from the previous experiment. In the case of *too*, however, a similar effect cannot be detected. I argued that this is so because the referential process for a temporal variable is more abstract than for an individual variable and thus harder to process. Another surprising result is that accommodation in the case of *know*, *stop*, and the definite does not seem to incur long lasting processing difficulties. This is especially striking in the case of *stop* where variable assignment in the positive condition seems to be much harder than accommodation in the neutral condition. One might be tempted to account for this by arguing that my assumptions about the accommodation of the PSPs introduced by *stop*, *know* and the definite are not warranted after all. However, the results of the experiment presented in Domaneschi et al. (2013) strongly suggest that they are. In their experiment, participants accommodated the PSPs of factive verbs and the definite under normal cognitive load 86% of the time and the one of change of state verbs in 83% of the cases. This clearly contrasts with the accommodation rate for iteratives and focus-sensitive particles (65% and 58% respectively). I will therefore keep my assumptions about how the PSPs of the various triggers are accommodated

and assume that self-paced reading is not sensitive enough to capture accommodation. A promising candidate to identify accommodation are ERPs. Burkhardt (2006) takes the P600 present in her experiment to signify discourse integration. Future research will have to determine whether this correlates with accommodation.

I would also like to point out that all effects emerged remarkably early. That is, the PSP was always processed as soon as it was obvious what the exact PSP is. In sentences with the definite determiner and *again*, effects arose even before the complete PSP was evident. When there was enough independent evidence that the PSP would most likely not be satisfied by the context, participants exhibited processing difficulties on the PSP trigger already. This is a very interesting result for a semantic processing model. The early processing of the presupposed material suggests that syntactic and semantic processing go hand in hand. This is especially evident in sentences with the definite determiner where effects arise even before the whole NP can be structurally integrated. However, recent experimental work suggests that the size of interpretation chunks depends on the the phenomenon under investigation. Bott and Schlotterbeck (2013) report a reading time study on the processing of doubly quantified sentence in which scopal assignment is processed relatively late. Hence, in order to come up with a realistic model of semantic processing, differences between different phenomena have to be taken into consideration. The results of the present experiment show that PSPs are a an *early processing phenomenon*.

Another important point in connection to this that the present experiment touches on is the difference between different readers, as suggested in Koornneef (2008). The post-hoc analysis of *know* revealed that there are different kinds of processors. The ones that determine and check a PSP as soon as possible and those that delay this step until a full phrase has been processed. This is another crucial observation which has to be kept in mind for a semantic processing model. Differences between interpreters have to be taken into considerations as well as differences between the phenomena investigated. Hence, the widely-discussed incrementality of sentence processing (e.g. Marslen-Wilson (1973) and Marslen-Wilson (1975)) cannot receive a general answer, but has do be decided on a case-by-case basis.

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4

Presuppositions and Quantifiers

4.1 Introduction

When it comes to PSPs, the most widely debated issue is the one of PSP projection. PSP projection, in essence, captures the fact that PSPs are not targeted by certain operators which affect the literal meaning of the sentence. This behavior is most prominent in what Chierchia and McConnell-Ginet (1990) have named the *Family of Sentences* (FoS). Each of the sentences in (1-a)-(1-e) below carries the same PSP in (1-f), even though their truth conditional content (if any) is quite different.

- (1) a. **Simple Sentence**
Susan stopped smoking.
- b. **Negation**
It is not the case that Susan stopped smoking.
- c. **Conditional**
If Susan stopped smoking, she lives a healthy life now.
- d. **Modal**
Susan might have stopped smoking.
- e. **Question**
Has Susan stopped smoking?
- f. **PSP in a. - e.**
Susan used to smoke.

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The question of how exactly these projection facts can be captured has given rise to a whole battery of theories. But even though there are still some disagreements as to what e.g. (7-c) presupposes (a conditional PSP or not - see the discussion in Geurts (1996)), the consensus is for the examples (1-b)-(1-e) that a global PSP which requires the global utterance context to entail the relevant PSP is the one that arises with most ease. However, the judgments are a lot less clear cut when it comes to another kind of environment which calls for projection, namely quantified statements. The question is, which PSP exactly arises when a PSP with an assignment dependent variable is triggered in one of the quantifiers arguments, as in (2).

- (2) a. No nation cherishes its king.
b. $[[\text{No nation}] [\lambda x [t_x \text{ cherishes its}_x \text{ king}]]]$

In the example above, the nuclear scope of the quantifier triggers the PSP that x has a unique king. However, x is bound by the quantifier *no*, as can be gathered from the LF in (2-b). So what exactly does (2-a) presuppose? That every nation has a king? That there exists at least one nation which has a king? Or nothing at all? The theories proposed in Heim (1983) and Beaver (1992) are on the two extreme ends with regard to what such a construction might presuppose. Heim's theory predicts for a sentence like (2) a *universal* PSP, i.e. that every nation has a king. In contrast, the reasoning laid out by Beaver leads to an existential PSP, i.e. that there exists (at least) one nation which has a king. In a questionnaire study, Chemla (2009) investigated which theory captures the judgments about the PSPs people perceive in sentences like (2) best. The results will be discussed later. Let me point out, however, that offline intuition judgments are not fully suited to tackle the intricate question of which of the two theories makes the better predictions since both - Heim and Beaver - leave room for accommodation in their respective theories. Depending on which kind of accommodation is chosen, a sentence like (2) can end up with an existential PSP, a conditional PSP, or no PSP at all (cf. Kadmon (2001)). Since the kind of local accommodation envisaged here differs from 'standard' accommodation in simple sentences in that it is inferior to global accommodation, it is reasonable to assume that applying it will require extra processing effort. Online measures are thus able to provide us with deeper insights into what the processor does when it encounters a sentence like the one in (2).

In this chapter, I will investigate the question of how PSPs are processed in the scope of non-referring NPs. The experiment uses eye tracking to ensure a reading experience which is as natural as possible.

In the next section, I will give a short introduction to Heim's (1982) Dynamic Semantic framework. This is necessary in order to discuss Heim's (1983) and Beaver's (1992) theories and what they assume about PSPs. In the subsequent section I will introduce and discuss the results from Chemla's (2009) questionnaire. The section after that lays out the experiment, the rationale behind it, and its results, which will lead to the general discussion in the last section.

4.2 Theoretical Background

4.2.1 Existence or Universality? (Heim, 1983; Beaver, 1992)

In this section, I will discuss the predictions that Heim's (1983) and Beaver's (1992) theories make about the projection of PSPs in the scope of quantified NPs. Both theories are formulated in a dynamic framework which views the meaning of a sentence as its context change potential (short: CCP). In order to be able to discuss the relevant predictions, it will be necessary to take a brief detour and discuss Heim's (1982) Dynamic Semantic framework.

Heim's (1982) approach is motivated by the use of indefinite noun phrases like the one in (3).

(3) A dog came in. It lay down under the table.

Naturally, we understand the pronoun *it* to refer back to the dog which came in. However, this is not easily captured if we interpret the indefinite *a dog* as an existential quantifier. In order to be able to refer to it, we somehow want a specific discourse referent. To account for this fact, Heim (1982) proposes that an indefinite introduces a new individual into the domain of discourse. In order to capture this conceptually, Heim assumes that every NP carries a numerical subscript and is interpreted as a variable. This means that every NP is interpreted relative to a variable assignment function g . The difference between proper names and indefinite NPs on the one hand, and pronouns and definite NPs on the other hand is captured by Heim's *Novelty Condition*

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and *Familiarity Condition*, respectively. Novelty, in essence, means that the numerical associated with the variable on the relevant NP must not be in the domain of g . Conversely, the numerical index on a variable must be in the domain of g in order to fulfill the familiarity requirement. Under this analysis, the (simplified) tree for the first sentence in (3) looks as follows:

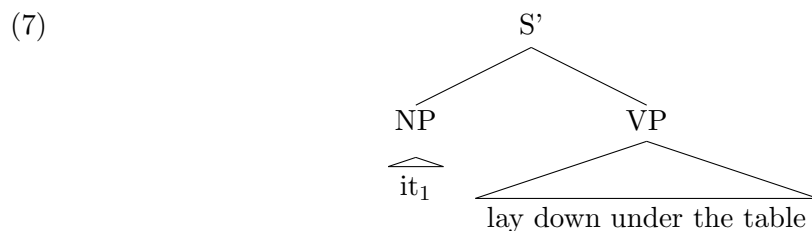


The indefinite introduces a new index 1 into g and requires that $g(1) = \text{a dog}$. The VP in turn requires that $g(1) = \text{came in}$. Under this analysis, both NP and VP are open formulae which are interpreted as conjuncted, cf. (5). If we assume a simplified notion of context c as a set of assignment functions, the update of c with S can be captured as follows:

(5) $c+S = (c+NP)+VP$

(6) $c+S = \{g: \text{dom}(g)=\{1\} \text{ and } g(1) \text{ is a dog and } g(1) \text{ came in}\} = c'$

In the second sentence, the index on the pronoun has to be old by the virtue of *familiarity* and thus, the sentence updates context c' in the way laid out below.



(8) $c'+S' = \{g: \text{dom}(g)=\{1\} \text{ and } g(1) = \text{a dog and } g(1) = \text{came in and } g(1) = \text{lay down under the table}\}$

Turning to PSP projection out of quantified statements, we have to assume a slightly more complex context which consists of world-assignment pairs, $\langle w, g \rangle$, where all assignments have the same domain.

In dynamic semantics, the role of PSPs is seen as placing conditions on the availability of context updates. More precisely, an update of a context c with a sentence S can only take place if the PSPs of S are entailed by c , i.e. if the PSPs are *satisfied*. Only then does the context *admit* the sentence and S can update c . According to this analysis, a PSP is satisfied in a context only if all world-assignment pairs in c entail p . Kadmon (2001) formulates this requirement in the following way:

$$(9) \quad c \text{ satisfies a PSP } \alpha \text{ iff for every } \langle w, g \rangle \in c, \exists g' \supseteq g \text{ s.t. } \langle w, g' \rangle \in c + \alpha$$

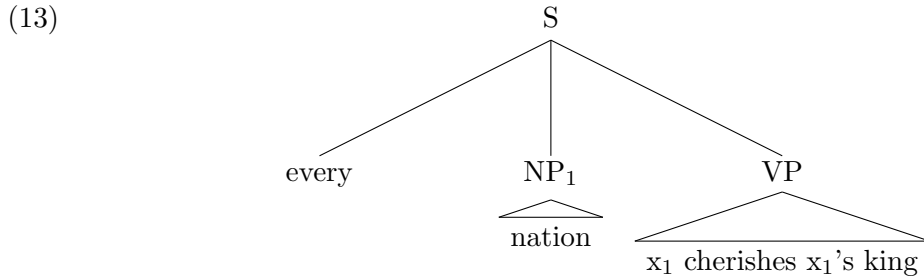
In Heim’s framework, quantifiers are context update operators which come with their own CCP. According to Heim, the CCP of the quantifier *every* is the one given in (10). Heim points out that in order to yield the adequate truth conditions, it has to be made sure that x_i is a new variable. This is captured by the condition in (11).

$$(10) \quad c + [\text{every } x_i \text{ A B}] \\ = \{ \langle w, g \rangle \in c : \text{for every } a, \text{ if } \langle g[a/i], w \rangle \in (c+A), \text{ then } \langle g[a/i], w \rangle \in (c+A)+B \}$$

$$(11) \quad \text{for any assignments } g \text{ and } g' \text{ that differ at most in their } i\text{-th member, and for any world } w: \langle w, g \rangle \in c \text{ iff } \langle w, g' \rangle \in c$$

Heim (1982) postulates that operators are adjoined as sisters to their arguments. Thus, a sentence with a quantified NP as in (12) has the logical form shown in (13).

$$(12) \quad \text{Every nation cherishes its king.}$$



As in the example above, the first context update is performed by calculating $c + x_1$ is a nation, yielding a new context c' . The VP is then evaluated with respect to c' . Since the VP triggers the PSP that x_1 has a king, it will only be admitted if c' satisfies this PSP. This is captured formally in (14). If this is the case, the result of this update is the one in (15).

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(14) for every $\langle w, g \rangle \in c + \{\langle w, g \rangle: g(1) \text{ is a nation in } w\}$, $\exists g' \supseteq g$ s.t. $\langle w, g' \rangle \in (c + \{\langle w, g \rangle: g(1) \text{ is a nation in } w\}) + g(1) \text{ has a king in } w$

(15) $c + (12) = \{\langle w, g \rangle \in c: \text{for every } a, \text{ if } \langle g[a/1], w \rangle \in (c + [x_1 \text{ is a nation}])\}$, then $\langle g[a/1], w \rangle \in (c + [x_1 \text{ is a nation}]) + [x_1 \text{ cherishes } x_1 \text{'s king}]$

The requirement in (14) is such that for every world-assignment pair in the context, when $g(1)$ is a nation in w , $g(1)$ has to have a king in w . By the virtue of (11), x_1 is a new variable, thus yielding the PSP that every nation has a king.

We have seen before, that indefinites are also treated as introducing new variables into the domain of discourse. Due to this fact, Heim's theory predicts a universal PSP also in those cases where the PSP is triggered in the scope of an indefinite, as in (16).

(16) A fat man was pushing his bicycle.

However, Heim herself notes that this is a very strong PSP which does not show up empirically. To remedy this, she suggests that *local accommodation* has to take place. This means that instead of calculating (17), there is an intermediate step of adding the PSP of the VP to $c + NP$ which ensures that the update of $(c + NP) + VP$ goes through smoothly, see (18).

(17) $c + NP + VP = (c + NP) + VP$

(18) $c + NP + VP = ((c + NP) + PSP(VP)) + VP$

If people choose to locally accommodate like this, (16) no longer requires that all fat man have a bicycle, but merely asserts that a fat man who owns a bicycle pushes his bicycle.

Beaver (1992) takes up on this observation. Instead of viewing *local accommodation* as a repair mechanism, he builds it into the PSP satisfaction requirement. His crucial move is to eliminate the requirement that all variable assignments in every world satisfy the PSP. For him, it is sufficient that there exists a variable assignment in every world which satisfies the PSP. His reformulation of (9) is given in (19). For the sentence in (12), this yields the weaker PSP in (20) that there has to be a nation which has a king.

(19) c satisfied a PSP α iff for every $\langle w, g \rangle \in c$, $\exists g'$ s.t. $\langle w, g' \rangle \in c + \alpha$

- (20) for every $\langle w, g \rangle \in c + \{\langle w, g \rangle : g(1) \text{ is a nation in } w\}$, $\exists g'$ s.t. $\langle w, g' \rangle \in (c + \{\langle w, g \rangle : g(1) \text{ is a nation in } w\}) + g(1) \text{ has a king in } w$

In addition to Heim’s account, Beaver’s formulation makes sure that all variable-assignment pairs which do not satisfy (20) are “kicked out” of c . Eventually, this will yield the same result as local accommodation. The difference is that for Heim, local accommodation is a repair mechanism, whereas under Beaver’s account, it is basic.

These two theories will be the basis for the experiment to follow, because they make nicely different, testable predictions. Over the years, many modifications have been proposed to capture the empirical data better. However, to date, it is still not entirely clear how the empirical picture actually looks like. Speakers vary in their judgments of what kind of PSP is triggered in these kinds of sentences. Moreover, since for example Heim’s (1982) theory allows for local accommodation, there might be a difference between the PSP that is *linguistically* triggered and the one that *cognitively* perceived. A time sensitive empirical modality like eye tracking is suitable to provide deeper insights into the time course in which these kinds of PSPs are interpreted. But before I turn to my experiment, I will take a brief look at the experimental data already present on this issue.

4.3 Experimental Data (Chemla, 2009)

Chemla (2009) is one of the first empirical approaches to the question of how PSPs project out of the scope of quantifying environments. He conducted two questionnaire studies comparing the (existential or universal) inferences made. To this end, several quantifiers and PSP triggers were employed. In the first study, the quantifiers used were *Each*, *No*, *Less than 3*, *More than 3* and *Exactly 3*. The PSP triggers included factive verbs (*know* and *be unaware*), change of state predicates (*stop* and *continue*), and definite descriptions (*his*). In the study, participants had to judge whether (21-b) is a viable inference given the sentence in (21-a).

- (21) a. None of these 10 students knows that his father will receive a congratulation letter.
 b. The father of each of these 10 students will receive a congratulation letter.

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Participants were asked to answer whether (21-a) suggests (21-b) by giving a yes/no answer. Additionally, in order to test whether participants would accept more fine grained, scalar readings, the quantifier in (21-b) was varied between *at least one*, *at least three*, and *more than three*. The results showed that there was a significant difference of the availability of universal PSPs depending on the quantifier chosen. While the universal inference was very strong in sentences with *each* and *no*, considerably less universal PSPs arose when the quantifier was *less than 3*, *more than 3*, or *exactly 3*. Another interesting result is the time that participants needed in order to make their choice. There was a clear difference in response times when participants either accepted or rejected the universal inference for sentences with *no* with the latter resulting in much longer response times than the former. This difference did not arise in conditions with numerical quantifiers and thus suggests that universal inferences for sentences with *no* a the preferred interpretation.

In a second experiment, Chemla (2009) made some minor changes to the original design. Instead of asking for a yes/no answer, participants were now asked to give their response on a graded scale which ranged from “no” to “yes”. Crucially, the question whether A suggests that B remained the same. Another difference from the first experiment is that more quantifiers were included (*most*, *few*, *many*) and that the numerical quantifiers were *less than 6*, *more than 6*, and *exactly 6*. In this experiment, Chemla (2009) additionally included sentences like (22) where the PSP is not triggered in the nuclear scope, but in the restrictor of the quantifier.

- (22) Among these 20 students, {each/none} who knows that his father is going to receive a congratulation letter takes Italian lessons.

As before, for sentences with the PSP triggered in the nuclear scope, universal inferences were highly accepted when the quantifier was *each* or *no*, and less so in the case of other quantifiers. However, this difference was absent in conditions with the PSP in the restrictor.

Chemla (2009) argues that these results suggest that PSPs are not uniformly projected from every quantifier there is. Instead of subscribing himself to the idea that PSPs are always either projected universally (Heim, 1983) or existentially (Beaver, 1994, 2001), Chemla (2009) argues for theories which predict that the projection behavior changes with the quantifier (Chemla, 2008; George, 2008).

4.4 Experiment: Presuppositions in the Scope of Quantified NPs, Eye Tracking Data

While these results provide very interesting insights into the interpretation of PSPs in quantified statements, they do not inform us about the time course in which this interpretation proceeds. The projection out of quantified statements is a difficult matter which is even more complicated if we assume a mechanism like local accommodation to be standardly available. This means that there might be several ways to reach one and the same interpretation eventually. By asking for offline judgments, the final interpretation is all we get. However, in order to be able to discriminate between theories such as Heim's (1983) and Beaver's (1992), it is necessary to obtain more time sensitive measures to judge which difficulties the interpreter encounters during interpretation.

4.4 Experiment: Presuppositions in the Scope of Quantified NPs, Eye Tracking Data

In this section, I will present an experiment using eye tracking during reading to test how people interpret the PSP of *wieder* when its individual argument is bound by a quantifier. Specifically, this experiment is designed to get a deeper understanding of how PSPs are interpreted that appear in the scope of the universal quantifier *jede/r* ('each') and the existential quantifier *eine/r* ('a'/'one'). Moreover, I will compare *wieder* to the definite determiner. As the definite determiner is the case most widely discussed in the literature, including it in the experiment ensures that the results can contribute something to the ongoing debate. It is furthermore a goal of this thesis to investigate if different PSP triggers are processed in different ways. The experiment discussed in the last chapter showed that this seems to be the case in unembedded environments. This experiment aims at extending this line of research to more complex sentences. Another point why it is a good idea to compare these two triggers comes from recent work by Charlow (2009). He suggests that PSPs triggered by a hard trigger (like *again*) project differently out of quantified statements than PSPs triggered by a soft trigger (like the definite article). More precisely, he argues that PSPs which stem from hard triggers project universally even in the scope of an existential quantifier. The example in (23) illustrates that it is very odd to utter a sentence like (23-c) in a context like (23-a), whereas the same sentence is acceptable in a context like (23-b).

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- (23)
- a. Just five of those 100 students smoke. They all smoke Newports.
 - b. Each of those 100 students smokes. They all smoke Newports.
 - c. Unfortunately, some of those 100 students also smoke Marlboros.

This is another way in which the present experiment extends on Chemla’s (2008) work. In his experiment, Chemla only tested how PSPs of soft triggers like factives are understood when they appear in one of the arguments of a quantifier. Thus, no comparison between hard and soft triggers can be made. This experiment aims at reconciling this.

4.4.1 Methods and Material

All in all, there were four different combinations of quantifiers and triggers: *one* and the definite article, *each* and the definite article, *one* and *again*, and *each* and *again*. Each of these combinations was treated as a separate experiment. For each experiment, 28 items were created. The items comprised of two context sentences and a target sentence. The first context sentence was such that it introduced three people which all shared a common property, e.g. they were all attendants at a conference, like in (24). The second context sentence then specified another property which was either true for all three individuals (*three of three* context) or only for two (*two of three* context) of them. This sentence was followed by the target sentence with a subject NP with either *jede/r* (‘each’) or *eine/r* (‘a’/‘one’). The partitive construction was used to make the domain of quantification as clear as possible. It also made sure that the sentences were similar to the material used in Chemla’s (2008) experiment, which also employed partitive constructions in order to discourage unmotivated implicit domain restriction. Additionally, a control condition was introduced to ensure that potential differences between the two conditions are not solely due to the different contexts. In the case of the definite determiner, the control condition used was the indefinite determiner instead of the definite. For sentences with *wieder*, a temporal adverb or a prepositional phrase without PSP were used in the place of *wieder*. The contexts and target sentences were kept as parallel as possible in order to keep confounding factors as minimal as possible. Below are two example items from the material used.

4.4 Experiment: Presuppositions in the Scope of Quantified NPs, Eye Tracking Data

- (24) a. Sabine, Inge und Karin nehmen an einer Konferenz teil. Sabine und Inge haben neulich einen Laptop von ihrem Arbeitgeber bekommen, während Karin erst einen Laptop kaufen muss.
Sabine, Inge and Karin take in a conference part. Sabine and Inge have recently a laptop from their employer received, whereas Karin still a laptop to buy has
Sabine, Inge and Karin are at a conference. Sabine and Inge got a laptop from their employer recently, whereas Karin still has to buy a laptop herself.
- b. Sabine, Inge und Karin nehmen an einer Konferenz teil. Sabine und Inge haben neulich einen Laptop von ihrem Arbeitgeber bekommen, während Karin selbst einen Laptop kaufen musste.
Sabine, Inge and Karin take in a conference part. Sabine and Inge have recently a laptop from their employer received, whereas Karin herself a laptop to buy had
Sabine, Inge and Karin are at a conference. Sabine and Inge got a laptop from their employer recently, whereas Karin had to buy a laptop herself.
- (25) Heute hat {(a) jede/(b) eine} der drei Konferenzteilnehmerinnen
Today has {(a) each/(b) one} of the three conference attendees
{ihren/einen} Laptop in einer Sitzung benutzt.
{her/a} laptop in a session used
Today, {(a) each/(b) one} of the three conference attendees used {her/a} laptop during a session.
- (26) a. Marie, Sophie und Anna spielen an einem Theater. Sophie und Marie waren letzte Woche Schlittschuhlaufen, während Anna noch nie Schlittschuhlaufen war.
Marie, Sophie and Anna play at a theater. Sophie and Marie were last week ice-skating, whereas Anna still not ice-skating was
Marie, Sophie and Anna are all playing at a theater. Last week, Sophie and Marie went ice-skating, whereas Anna has never been ice-skating yet.
- b. Marie, Sophie und Anna spielen an einem Theater. Sophie und Marie waren letzte Woche Schlittschuhlaufen, während Anna vor zwei Wochen Schlittschuhlaufen war.
Marie, Sophie and Anna play at a theater. Sophie and Marie were last week ice-skating, whereas Anna ago two weeks ice-skating was
Marie, Sophie and Anna are all playing at a theater. Last week, Sophie

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and Marie went ice-skating, whereas Anna went ice-skating two weeks ago.

- (27) Gestern war {(a) jede/(b) eine} der drei Schauspielerinnen
Yesterday was {(a) each/(b) one} of the three actresses
{wieder/abends} Schlittschuhlaufen, weil das Wetter so schön
{again/in the evening} ice-skating, because the weather so nice
war.
was
*Yesterday, {(a) each/(b) one} of the three actresses went ice-skating again
because the weather was very nice.*

The material was divided into two separate sessions. One experiment contained the (a)-versions of (25) (*each...*) and the (b)-versions of (27) (*one...*), and the other experiment comprised the (b)-versions of (25) (*one...*) and the (a)-versions of (27) (*each...*). This means that the *wieder* items and the items with the def. determiner acted as filler for each other. Additionally, 28 unrelated filler items were created and presented in both experimental sessions, yielding a total of 84 items per experimental session.

Subjects read the sentences on a computer screen while their eyes were being tracked by an EyeLink 1000 eye tracker from SR Research. For half of the items (experimental and filler), participants had to answer yes/no questions, which followed directly after the sentence, to ensure full comprehension of the materials. For each of the two experimental sessions, the data of 24 participants were collected. All of them were native speakers of German from the University of Tübingen community with normal or corrected to normal vision.

4.4.2 Predictions

This section is dedicated to determine what predictions can be derived from the theories of Heim (1983) and Beaver (1992) about the processing of the sentences used in these experiment. In the introduction, I have already mentioned that according to Heim's theory, PSPs should always project universally, whereas Beaver's theory merely predicts an existential PSP. Now let us look at how these assumptions come about for the sentence material used here and what this could mean for the time course of processing.

Here, I will exemplify the exact reasoning by discussing the sentence in (28). The rationale presented here is the same for all four kinds of test sentences used in the present experiment.

4.4 Experiment: Presuppositions in the Scope of Quantified NPs, Eye Tracking Data

- (28) Heute hat jede der drei Konferenzteilnehmerinnen ihren Laptop in einer Sitzung benutzt.
 Today has each of the three conference attendees her laptop in a session used
Today, each of the three conference attendees used her laptop during a session.

Remember that the contexts were such that in one context, two of the three individuals possess the necessary property (*two of three*), whereas in the second context, the relevant property is true of all of them (*three of three*). So let us look at the two contexts in turn. The English versions of the two contexts for (28) are repeated in (29-a) and (29-b).

- (29) a. *Sabine, Inge and Karin are at a conference. Sabine and Inge got a laptop from their employer recently, whereas Karin still has to buy a laptop herself.*
 b. *Sabine, Inge and Karin are at a conference. Sabine and Inge got a laptop from their employer recently, whereas Karin had to buy a laptop herself.*

For the sake of simplicity, I will neglect the partitive in the target sentence and will instead discuss the sentence in (30-a), with the LF in (30-b) ¹:

- (30) a. *Today, each conference attendee used her laptop during a session.*
 b. [Each conference attendee [λx [t_x used her_x laptop during a session]]]

The nuclear scope triggers the PSP that x has a laptop. This PSP is evaluated after the context has been updated with the restrictor. The requirement for PSP satisfaction that follows from this is thus (31) for Heim and (32) for Beaver.

- (31) for every $\langle w, g \rangle \in c + \{ \langle w, g \rangle : g(i) \text{ is a conference attendee in } w \}$, $\exists g' \supseteq g$ s.t. $\langle w, g' \rangle \in (c + \{ \langle w, g \rangle : g(i) \text{ is a conference attendee in } w \}) + g(i)$ has a laptop in w

- (32) for every $\langle w, g \rangle \in c + \{ \langle w, g \rangle : g(i) \text{ is a conference attendee in } w \}$, $\exists g'$ s.t. $\langle w, g' \rangle \in (c + \{ \langle w, g \rangle : g(i) \text{ is a conference attendee in } w \}) + g(i)$ has a laptop in w

¹The partitive is added to ensure that participants do not employ unnecessary domain restrictions. Both Heim (1983) and Beaver (1992) do not discuss partitives. But as far as I can see, the predictions should be the same with or without it.

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Let us assume that after updating c with the restrictor, we are left with two worlds in our context. Given the fact that the restrictor introduces a new variable x_i and requires of it to be a conference attendee, we end up with three different variable assignments which assign i to Sabine, Inge, and Karin, respectively. Let us call them g_s , g_i , and g_k . Consequently, the context in which the PSP of (30-a) is evaluated is the one given in (33).

$$(33) \quad c = \{\langle w_1, g_s \rangle, \langle w_1, g_i \rangle, \langle w_1, g_k \rangle, \langle w_2, g_s \rangle, \langle w_2, g_i \rangle, \langle w_2, g_k \rangle\}$$

If we go back to the contexts, (29-b) is such that it satisfies the PSPs in both (31) and (32). However, (29-a) only satisfies the PSP in (32), because in this context, $\langle w_1, g_k \rangle$ and $\langle w_2, g_k \rangle$ do not fulfill the requirement in (31).

We have seen in the previous experiments that an unfulfilled PSP results in inflated reading times. Heim's theory predicts that a context in which only two out of the three individuals possess the presupposed property, does not satisfy the resulting PSP of all of the test sentences in the present experiment. Consequently, the prediction is that there should be a reading time difference between a test sentence presented in a context like (29-a) and (29-b), with the former evoking longer reading times than the latter. Considering the timing of the expected effect, it will be interesting to see when the effect arises. The previous experiments have shown that effects due to an unsatisfied PSP show up at the earliest possible time during reading. An interesting question that comes up with respect to the more complex sentences used in this experiment is whether the added complexity has an effect on the time course.

If we assume Beaver's theory, the resulting existential PSP is satisfied in context (29-a) as well as (29-b). Consequently, no reading time differences are expected between the two conditions.

I have already mentioned that Heim's account allows for *local accommodation*. The result of performing local accommodation is parallel to what Beaver's theory predicts. However, the basic PSP Heim assumes is a universal one which is not satisfied in the *two of three* contexts. The previous experiments have shown that processing difficulties in the form of longer reading times arise as soon as a PSP is not given in the context, irrespective of accommodation or other strategies. I will therefore assume that those conditions which call for local accommodation, i.e. the conditions in which only two out of three individuals make the PSP true, should still result in longer reading times.

Independent of which quantifier and which trigger are used, the predictions for the reading times that can be derived from the theories presented in Heim (1983) and Beaver (1992) are the following:

Reading Time Expectations

Heim: context *two of three* > context *three of three*

Beaver: context *two of three* = context *three of three*

4.4.3 Results

For analyzing the data, standard reading measures were computed (Rayner, 1998): first fixation duration, which measures the time of the very first fixation on the region of interest; first pass time, which sums up all fixations on the region of interest before leaving it to the left or the right, and total duration which sums up all fixations on the region of interest no matter when they occur.

The analyses were carried out using the R programming language (R Development Core Team) as linear mixed models, using the program *lmer* (Bates, 2005). The fixed factor was context (*two of three / three of three*). The random factors were subjects and items. Additionally, models with random slopes for both subjects and items were calculated. When an ANOVA revealed a significant difference between the models, I included the more complex model into the analysis. Fixations shorter than 80 ms and within one character space of the previous or next fixation were merged with this fixation. The remaining fixations shorter than 80ms and longer than 1200ms were excluded. Additionally, trials were deleted if one of the reading measures deviated by 3 SD or more from the mean on one of the ROIs in the respective condition.

One...definite determiner Since every quantifier - trigger combination was treated as a separate experiment, I will go through the results for each of these combinations one by one. This paragraph summarizes the results for the combination *one* + definite determiner as in the sentence in (34).

- (34) Heute hat eine der drei Konferenzteilnehmerinnen ihren Laptop in einer
Today has one of the three conference attendees her laptop in a
Sitzung benutzt.
session used
Today, one of the three conference attendees used her laptop during a session.

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The tables in 4.1, 4.2, and 4.3 present the mean first fixation duration, first pass duration, and total duration, respectively, for sentences containing the definite determiner.¹

condition	Quantified NP <i>eine der</i> <i>drei Konferenzteilnehmerinnen</i>	Trigger <i>ihren</i>	crit. word <i>Laptop</i>	cw+1 <i>in</i>	cw+2 <i>einer</i>	cw+3 <i>Sitzung...</i>
three of three	207.7	224.2	208	212.2	228	250
two of three	214.2	227.4	205.7	211.3	226.6	247

Table 4.1: Mean first fixation duration in ms for *one...def*

condition	Quantified NP <i>eine der</i> <i>drei Konferenzteilnehmerinnen</i>	Trigger <i>ihren</i>	crit. word <i>Laptop</i>	cw+1 <i>in</i>	cw+2 <i>einer</i>	cw+3 <i>Sitzung...</i>
three of three	495.4	243.7	229.3	222.6	278	317.2
two of three	545	240	222.3	218.7	274.1	312.6

Table 4.2: Mean first pass duration in ms for *one...def*

condition	Quantified NP <i>eine der</i> <i>drei Konferenzteilnehmerinnen</i>	Trigger <i>ihren</i>	crit. word <i>Laptop</i>	cw+1 <i>in</i>	cw+2 <i>einer</i>	cw+3 <i>Sitzung...</i>
three of three	722.7	296.8	295.6	280.4	369	393.7
two of three	842.6	292.7	268.6	259	344	380.7

Table 4.3: Mean total duration in ms for *one...def*

For most of the regions, all numerical differences for all measures are not significant (all $p > .05$). The only statistical significant difference emerges on the quantified NP in the total reading time. Here, the reading times in the *three of three* condition are considerably lower than reading times in the *two of three* condition ($|t| = 2.423$, $p < .05$). A trend in the same direction can be found in the control condition containing the indefinite instead of the definite article ($|t| = 2.199$, $p < .1$).

One...again This paragraph provides the results for sentences in which *again* was in the nuclear scope of an existential quantifier, as in (35).

¹There were no significant effects in the control conditions other than the ones reported. Tables for the respective reading times are left out for ease of presentation. They can be found in the appendix.

4.4 Experiment: Presuppositions in the Scope of Quantified NPs, Eye Tracking Data

- (35) Gestern war eine der drei Schauspielerinnen wieder Schlittschuhlaufen,
 Yesterday was one of the three actresses again ice-skating,
 weil das Wetter so schön war.
 because the weather so nice was
Yesterday, one of the three actresses went ice-skating again because the weather was very nice.

Table 4.4 provides the mean first fixation durations, table 4.5 the first pass durations and table 4.6 the total reading times for the respective regions.

condition	Quantified NP <i>eine der drei Schauspielerinnen</i>	Trigger <i>wieder</i>	crit. word <i>Schlittschuhlaufen</i>	cw+1 <i>weil</i>	cw+2 <i>das</i>	cw+3 <i>Wetter...</i>
three of three	220	225.2	230	209.9	210.3	209.2
two of three	212.9	210.8	235.3	223.6	212.5	221.3

Table 4.4: Mean first fixation duration in ms for *one...again*

condition	Quantified NP <i>eine der drei Schauspielerinnen</i>	Trigger <i>wieder</i>	crit. word <i>Schlittschuhlaufen</i>	cw+1 <i>weil</i>	cw+2 <i>das</i>	cw+3 <i>Wetter...</i>
three of three	649	239.6	293.6	219.7	225.2	237
two of three	634	220.8	301.5	231	237	248

Table 4.5: Mean first pass duration in ms for *one...again*

condition	Quantified NP <i>eine der drei Schauspielerinnen</i>	Trigger <i>wieder</i>	crit. word <i>Schlittschuhlaufen</i>	cw+1 <i>weil</i>	cw+2 <i>das</i>	cw+3 <i>Wetter...</i>
three of three	882.2	262.9	345.4	233	256	266.1
two of three	841.9	253.7	342.6	257.8	258.5	288.5

Table 4.6: Mean total duration in ms for *one...again*

None of the observed numerical differences between the two conditions are significant for any of the reading measures (all $ps > .05$).

Each...definite determiner The results for sentences with the definite determiner headed by a universally quantified NP as in (36) are presented in this paragraph.

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- (36) Heute hat jede der drei Konferenzteilnehmerinnen ihren Laptop in einer
 Today has each of the three conference attendees her laptop in a
 Sitzung benutzt.
 session used
Today, each of the three conference attendees used her laptop during a session.

The mean first fixation duration, mean first pass duration and mean total duration for each sentence segment are given in 4.7, 4.8, and 4.9 respectively.

condition	Quantified NP <i>jede der drei Konferenzteilnehmerinnen</i>	Trigger <i>ihren</i>	crit. word <i>Laptop</i>	cw+1 <i>in</i>	cw+2 <i>einer</i>	cw+3 <i>Sitzung...</i>
three of three	203.9	234.3	207.3	207.2	220.5	255
two of three	205.5	239.1	204.3	216.5	230.7	246.2

Table 4.7: Mean first fixation duration in ms for *each...def*

condition	Quantified NP <i>jede der drei Konferenzteilnehmerinnen</i>	Trigger <i>ihren</i>	crit. word <i>Laptop</i>	cw+1 <i>in</i>	cw+2 <i>einer</i>	cw+3 <i>Sitzung...</i>
three of three	571.7	245.1	224.5	209.8	259.2	320.4
two of three	545.4	255.7	221.4	233	270	302.2

Table 4.8: Mean first pass duration in ms for *each...def*

condition	Quantified NP <i>jede der drei Konferenzteilnehmerinnen</i>	Trigger <i>ihren</i>	crit. word <i>Laptop</i>	cw+1 <i>in</i>	cw+2 <i>einer</i>	cw+3 <i>Sitzung...</i>
three of three	702.6	279.4	256.6	244.3	323	365.6
two of three	780.9	308.5	273.4	261.1	343.7	343.9

Table 4.9: Mean total duration in ms for *each...def*

For all measures, reading times are numerically higher on the two words succeeding the critical word in the *two of three* context in contrast to the *three of three* context. For the first pass duration, there is a significant difference on the word after the critical word ($|t| = 1.988$, $p < .05$) with the sentence in the *two of three* condition receiving longer reading times than the sentence in the *three of three* condition. The graph in Figure 4.1 depicts the mean first pass duration for the regions of interest.

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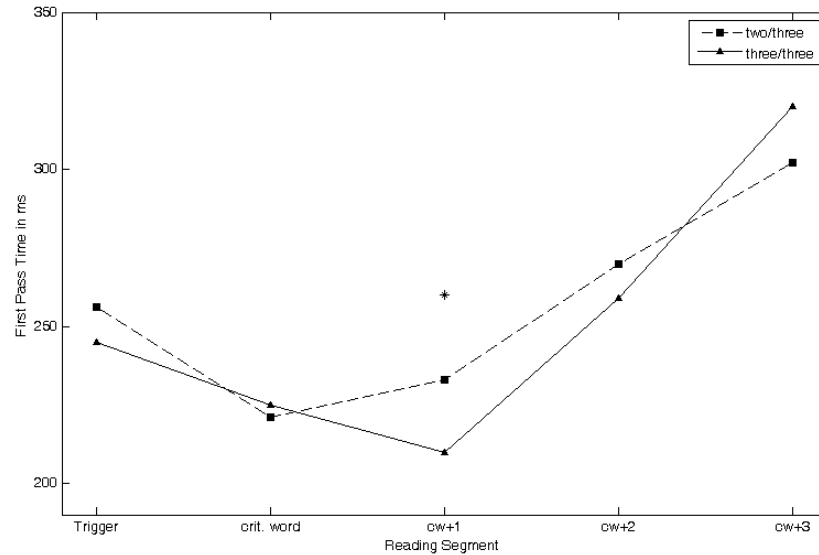


Figure 4.1: Mean first pass duration for regions of interest in ms for *each...def*
 - Asterisk indicates statistical significant at the $p < .05$ threshold

Each...again Finally, this paragraph sums up the results for sentences with *again* headed by an universally quantified NP as in (37).

- (37) Gestern war jede der drei Schauspielerinnen wieder Schlittschuhlaufen,
 Yesterday was each of the three actresses again ice-skating,
 weil das Wetter so schön war.
 because the weather so nice was
Yesterday, each of the three actresses went ice-skating again because the weather was very nice.

As before, Table 4.10 provides an overview of the mean first fixation durations. Table 4.11 presents the mean first pass durations, and Table 4.12 summarizes the mean total reading times.

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condition	Quantified NP <i>jede der drei Schauspielerinnen</i>	Trigger <i>wieder</i>	crit. word <i>Schlittschuhlaufen</i>	cw+1 <i>weil</i>	cw+2 <i>das</i>	cw+3 <i>Wetter...</i>
three of three	204.3	226.1	215.4	198.7	217	226.3
two of three	205.3	223.8	221	218.9	205.2	216.3

Table 4.10: Mean first fixation duration in ms for *each...again*

condition	Quantified NP <i>jede der drei Schauspielerinnen</i>	Trigger <i>wieder</i>	crit. word <i>Schlittschuhlaufen</i>	cw+1 <i>weil</i>	cw+2 <i>das</i>	cw+3 <i>Wetter...</i>
three of three	586.2	233.7	267.1	204.9	232.5	252.6
two of three	564.1	232.3	259.9	228.8	219.8	255

Table 4.11: Mean first pass duration in ms for *each...again*

condition	Quantified NP <i>jede der drei Schauspielerinnen</i>	Trigger <i>wieder</i>	crit. word <i>Schlittschuhlaufen</i>	cw+1 <i>weil</i>	cw+2 <i>das</i>	cw+3 <i>Wetter...</i>
three of three	851.8	279.6	319.1	215.6	257.6	295.7
two of three	896.8	295	329.2	260.2	237.8	324.9

Table 4.12: Mean total duration in ms for *each...again*

On the word after the trigger, first fixation durations and the total reading time increase in the *two of three* condition relative to the *three of three* condition. The only statistically significant effect appears on the word after the critical word (*weil* in the example above). At this point, first fixation durations, first pass durations and the total duration are significantly longer in the *two of three* condition than in the *three of three* condition (**first fixation:** $|t| = 2.27$, $p \approx .05$; **first pass:** $|t| = 2.48$, $p < .05$; **total duration:** $|t| = 3.041$, $p < .05$). Figure 4.2 depicts the mean first pass durations for the regions considered here.

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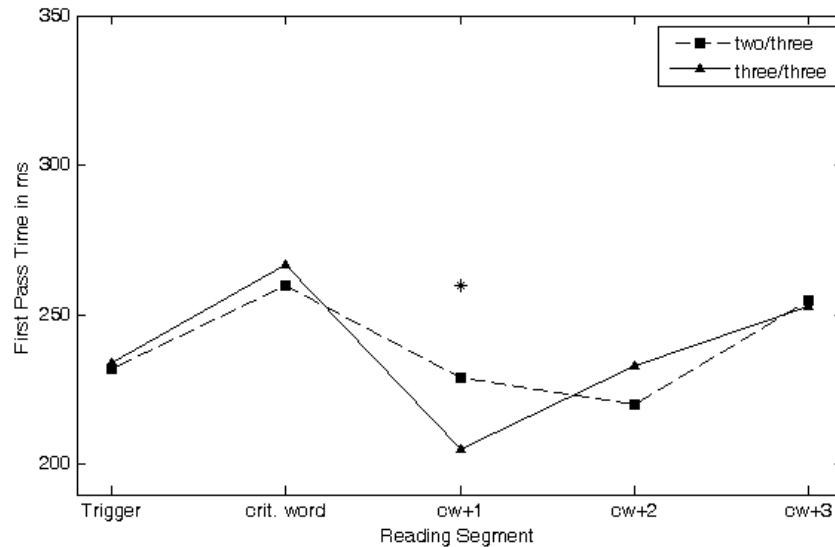


Figure 4.2: Mean first pass duration for regions of interest in ms for *each...again* - Asterisk indicates statistical significant at the $p < .05$ threshold

4.4.4 Discussion

This experiment shows that people display processing differences with a trigger appearing in the scope of a universal quantifier, but not when the PSP is triggered in the scope of an existential quantifier. In contrast to the experiments reported in the last two chapters, the observed effect arises one word after the critical word and not on the critical word directly. This is most likely due to the complex environment the PSP is triggered in. The last two experiments investigate the processing of PSPs in simple affirmative sentences where no projection was necessary. The fact that the effect in this experiment which calls for projection is visible only one word after the critical word can be taken to strengthen the point made in Schwarz and Tiemann (2012) and Schwarz and Tiemann (2013) that projection takes time. In the next chapter I will lay out a hypothesis why this is so.

Even more important, this experiment was set up to test the predictions of two theories present in the literature. The results of this experiment do not fit with either of the two. While the choice of the trigger does not seem to have a huge impact, it is obvious that it matters which quantifier is chosen. Recall that according to Heim's (1983) theory, all sentences with a PSP triggered in the scope of a quantified subject

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NP should yield a universal PSP. This means that every individual in the domain of discourse has to carry the relevant property for the PSP to be satisfied. Under this assumption, sentences which are presented in contexts where not all the relevant individuals satisfy this PSP should be harder to process. As discussed earlier, this should be so for every quantifier. However, the results of the present experiment show that there is no difference in reading measures between the different contexts when the subject NP is existentially quantified. The experiments in the last chapter have shown that participants are sensitive to unmet PSPs in reading time experiments. Moreover, Schwarz and Tiemann (2013) present the results of an eye-tracking experiment which demonstrates that reading times increase even in more complex settings (like in *if*-clauses) when the PSP of a sentence is not met. Therefore we have every reason to assume that any kind of PSP violation should become result in an increase of reading times for the different measures that eye-tracking provides. The lack of significant differences between the two conditions in the case of existentially quantified sentences hence suggests that the people perceive the PSP of the sentence as satisfied. More precisely, whatever they take the PSP of the sentence to be cannot be a universal PSP. This result is therefore at odds with Heim's theory but in line what Beaver's (1992) theory predicts. Yet, if we look at the universally quantified sentences, the picture is exactly the opposite. Here, we find significant differences between the two conditions. When the context did not provide the necessary grounds for the universal PSP to be satisfied, reading times were inflated. Specifically, first pass durations were higher when the trigger was *his/her*, and first pass durations, first fixation durations, and total reading times were higher in sentences with *again*.

These findings are quite astonishing because neither of the two theories discussed so far can account for the whole empirical picture. Whilst Heim's theory makes the wrong predictions in the case of existentially quantified sentences, Beaver's theory falls short when it comes to universally quantified sentences. But we do not want to dismiss the two theories that fast. Therefore I will now turn to possible factors which could explain the observed (or missing) effects. If there are such factors, it might turn out that one theory is still compatible with the results of the present experiment.

4.4.4.1 Local Accommodation

Let us first explore a possible explanation which could help to amend the predictions of Heim's theory. As mentioned before, Heim allows for a process which she calls *local accommodation*. This strategy can explain the fact that PSPs which are triggered in the syntactic scope of negation sometimes do not project. The standard example is given in (38).

- (38) It is not the case that the king of France attended the exhibition - because there is no king of France!

Assuming that projection out of operators is a core property of PSPs, the existence PSP in (38) should project out of negation. However, this is not the case since world knowledge (or the second part of the sentence) is in conflict with the PSP. Yet, the sentence in (38) is not completely out. According to Heim (1983), context update with a negated sentence proceeds in the following fashion:

- (39) $c + \text{NOT } S = c - (c + S)$

If S contains a PSP, c has to entail this PSP, i.e. $c + \text{psp} = c$. *Local accommodation* then describes the process in which those worlds in which p is true also get kicked out of the context set. This is captured informally in (40).¹

- (40) $c + \text{NOT } S_p = c - (c + p + S)$ local accommodation

Heim emphasizes that this kind of accommodation is less preferred than global accommodation which she takes to be the standard. However, she also exploits this kind of process for the interpretation of PSPs in sentences with non-referring NPs. In particular, she discusses the need for local accommodation in sentences which are headed by an indefinite NP. Heim concludes for the example repeated in (41) that the PSP is not that every fat man has a bike, but merely to assert that there exists a fat man who owns a bike and who pushes it.

- (41) A fat man was pushing his bicycle.

¹The subscript on S is taken to mean that S triggers the PSP p

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The line of reasoning here is as follows: First, $c+x_i$ is a fat man is calculated, resulting in c' . Because c' does not admit x_i was pushing x_i 's bicycle, it is amended to $c'+x_i$ owns a bicycle which then in turn admits x_i was pushing x_i 's bicycle. What is a little bit peculiar about this analysis is that this kind of interpretation seems to be preferred over global accommodation and that there are no outside factors which force this interpretation to come about. Heim notices this herself and thus redefines the notion of global accommodation in such a way that it also accommodates the kind of process described here. Details aside, I will refer to this process as *local accommodation* since it results in an interpretation of the sentence which does not place any restrictions on appropriate contexts - just like the interpretation in (40). And this is the relevant point here. If local accommodation of this sort exists and sentences like the ones used in this experiment are readily interpreted in this way, maybe this could account for the results in this experiment. Then a sentence like (42) would not presuppose anything but merely assert that there exists one of the three conference attendees who has a laptop and uses it during a session.

(42) Today, one of the three conference attendees used her laptop during a session.

If the sentence is interpreted in this way, it would not make any differences which of the two contexts it is presented in. First off, PSP violation would not occur because the sentence does no longer carry a PSP. Secondly, the sentence in (42) is not contradictory to either context since both contexts state explicitly that there are at least two conference attendees who own a laptop. Therefore, no reading time differences are expected.

However, there are at least two serious drawbacks to this idea. The first one is already inherent in Heim's theory. I have discussed earlier the dichotomy of *local accommodation* in the case of negation and in the case of quantifiers. When it comes to the former, local accommodation is strongly dispreferred to global accommodation and seems to appear only if outside factors force it to come about. In the case of the latter, however, especially with existentially quantified statements, local accommodation seems to be the norm rather than a last resort operation. This is part of the reason why Heim hesitated to call it local accommodation in the first place. But let us assume for a moment that this really is local accommodation and that it is thus only employed when needed. When is it needed? I would say that local accommodation is needed as

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soon as a context does not satisfy the PSP of a sentence. The fact that a PSP does not have to project but can be interpreted in the scope of an operator is what can save the sentence from PSP failure. In other words, only if a sentence is in danger of being undefined, local accommodation will kick in. This means for the quantified sentences that local accommodation of the sort discussed here should arise as soon as the universal PSP of the sentence is not satisfied. However, under this assumption there should be a difference between the two contexts provided in this experiment because one satisfies the universal PSP (three of three) and the other one does not (two of three). Yet, we do not find a significant difference in the case of existentially quantified sentences between the two contexts. One might argue that local accommodation of this sort happens so smoothly that it does not result in increased processing effort. Especially considering the result from the previous experiment that accommodation does not seem to be reflected in extensive processing costs. However, the experiments presented in the last two chapters provided very clear results that some kind of processing difficulty arises when a PSP is not given in the context. If we assume universal PSP projection, the PSP is not met in the *two of three* contexts. The fact that we see no processing effects whatsoever strongly suggests that this is not the PSP that people derive.

A second, maybe even more serious, argument against accommodation stems from the fact that we observe a difference between the two contexts in the case of universally quantified NPs. As Kadmon (2001) points out, there is no obvious reason why local accommodation should not be accessible in the case of universally quantified statements, too. Accordingly, a sentence like the one in (43) could be interpreted as follows: $c+x_i$ is one of the three conference attendees = c' , c' is amended to $c'+x_i$ owns a laptop, resulting in c'' . After that, $c''+x_i$ uses x_i 's laptop during a session is interpreted. This results in a context which entails that each of the three conference attendees who owns a laptop uses her laptop during a session.

(43) Today, each of the three conference attendees used her laptop during a session.

As before, we are faced with two options. One being that local accommodation is the default and therefore no effects due to the different context are expected. Yet, we find significant differences between the two context of the sort that reading times in a context which does not satisfy a universal PSP (two of three) are longer than in a context that provides the relevant information (three of three). This result fits with

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the second possible option in which local accommodation is only performed when PSP failure is at stake. Assuming what I said earlier about how local accommodation is a kind of reinterpretation which occurs when “normal” interpretation fails could account for the reading time pattern observed in the case of universally quantified NPs. But then we would have to explain why this effect is not present with existentially quantified NPs.

We have to conclude from the discussion above that local accommodation is not suitable to rectify the predictions of Heim’s theory as it stands. We either assume that local accommodation is the default and are thus able to account for the fact that there is no observed difference between the two conditions in existentially quantified statements but lack an explanation for the significant differences in the universally quantified case. But if we assume local accommodation to be a last resort process, we are facing the mirror image of that problem. It seems obvious that the difference lies within the quantifiers themselves. Yet, this is not easily captured in Heim’s theory. Let us therefore turn to Beaver’s theory and see if there is a possibility to rectify the discussed predictions.

4.4.4.2 Universal Entailment

The discussion in the last section made clear that Heim’s predictions cannot be reconciled with the experimental evidence by consulting local accommodation. But is there a possibility that Beaver’s theory can be modified as to account for the results obtained? Recall that his theory makes the correct prediction for the existentially quantified sentences. According to his approach, the PSP that arises in the scope of a quantifier is always existential and never universal. But this is at odds with the experimental results for universally quantified sentences. If the PSP is only existential in these cases as well, why is there a reading time difference between the two contextual conditions? At least for the sentences with the definite the answer might be obvious. To be fair, Beaver (1994) states that sentences with a universally quantified NP are odd in contexts where not every member of the quantified domain satisfies the PSP. His example is given in (44).

- (44) How many team members and cheerleaders will drive to the match?
Few of the 15 team members and none of the 5 cheerleaders can drive, but

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every team member will come to the match in her car. So expect about 4 to drive.

If the italicized sentence in (44) only triggered an existential PSP, the sentence should be fine. However, it is not. Beaver acknowledges this fact. Yet, he does not attribute the oddness of this example to a universal PSP. According to him, the universal implication is a mere entailment. If we go back to our test sentence, repeated in (45), one might argue that even if the projected PSP is existential, the assertion of the sentence is still odd in a context where not all relevant conference attendees possess a laptop.

(45) Today, each of the three conference attendees used her laptop during a session.

Assuming that the PSP of (45) is the one in (46-a) and thus satisfied in both experimental contexts, the assertion in (46-b) is still inconsistent with the *two of three* context.

- (46) a. $\exists x \exists !y [y \text{ is a laptop \& } x \text{ owns } y]$
b. $\forall x [x \text{ is one of the three conference attendees} \rightarrow \exists !y [y \text{ is a laptop \& } x \text{ owns } y \text{ \& } x \text{ uses } y \text{ during a session today}]]$

This observation could, in principle, account for the observed reading time pattern. But things are not that easy. The first very obvious objection comes from the data on *again*. Here we observed the same difference in reading time as in the sentences with the definite. However, when we look at the assertion in (48) of our experimental sentence repeated in (47), there is no inconsistency with either context sentence.

(47) Yesterday, each of the three actresses went ice-skating again because the weather was very nice.

(48) $\forall x [x \text{ is one of the three actresses} \rightarrow x \text{ went ice-skating yesterday}]$

But if the universal entailment does not arise in the case of *again*, why do we obtain the same pattern as in sentences with the definite? This cannot be easily explained even if we assume universal entailment to be responsible for the perceived oddity. I would like to mention a second point, however, which makes the suggested improvement even more questionable.

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I have mentioned earlier that Beaver's (1992) theory has a built-in mechanism which kicks out those world-assignment pairs which do not satisfy the PSP, leading to the same interpretation that local accommodation does. Let us again consider the model context set from above, repeated in (49). The experimental context is the one in (50).

$$(49) \quad c = \{\langle w_1, g_s \rangle, \langle w_1, g_i \rangle, \langle w_1, g_k \rangle, \langle w_2, g_s \rangle, \langle w_2, g_i \rangle, \langle w_2, g_k \rangle\}$$

(50) Sabine, Inge and Karin are at a conference. Sabine and Inge got a laptop from their employer recently, whereas Karin still has to buy a laptop herself.

(51) Today, each of the three conference attendees used her laptop during a session.

According to Beaver, $\langle w_1, g_k \rangle$ and $\langle w_2, g_k \rangle$ are kicked out of the context after the interpretation of (51) because these world-assignment pairs do not satisfy the PSP. In his dissertation, Beaver (2001) assumes that the interpretation of PSPs precedes the interpretation of the asserted material. The step of eliminating unfitting world-assignment pairs is part of PSP interpretation and should thus precede the interpretation of the assertion of the sentence. This means that by the time that the assertion in (46-b) is interpreted, the context should already be modified in such a way that it only furnishes world-assignment pairs which are consistent with the asserted content of the sentence. In other words, processing difficulties due to inconsistency should not arise. As I said earlier, the final interpretation under this set up is the same that local accommodation would lead to. I have argued in the last section that local accommodation should result in a costly reinterpretation and hence in inflated reading times. The reason why I do not expect any processing difficulties in this case is that the whole process in part and parcel of the way in which PSPs are interpreted according to Beaver. It should therefore happen automatically whereas local accommodation as it stands is a last-resort operation. But if this process is applied effortlessly, the reading time differences in sentences with a universal quantifier are unaccounted for. Conversely, even if this step of kicking out the incongruous world-assignment pairs came with an extra burden on processing, we would face the same dilemma that we do with local accommodation. We could not explain why there is no difference in the sentences with an existential quantifier.

We have to conclude that neither Heim's nor Beaver's theory can be supplemented in a way that would make them fit naturally with the results from the present experiment.

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This is unfortunate on the one hand because we are left with two theories that cannot account for the empirical data.

4.4.4.3 A third competitor

Since neither theory discussed above seems to be able to account for the empirical data, I will try to come up with a third way of looking at things. This approach is couched in a Heim and Kratzer (1998) framework. As discussed in the introduction, PSP triggers in a Heim and Kratzer style framework are partial functions which are only defined for that subset of their domain which satisfies the PSP. If, however, the PSP is not satisfied by any member in the trigger's domain, the output of the compositional interpretation is undefined. Moreover, the rule for Functional Application (FA), as stated in (52), ensures that the whole sentence with the trigger will be undefined in this case.

(52) **Functional Application:**

If α is a branching node and $\{\beta, \gamma\}$ is the set of α 's daughters, then α is in the domain of $\llbracket \cdot \rrbracket$ if both β and γ are and $\llbracket \gamma \rrbracket$ is in the domain of $\llbracket \beta \rrbracket$. In this case $\llbracket \alpha \rrbracket = \llbracket \beta \rrbracket (\llbracket \gamma \rrbracket)$ (Heim and Kratzer, 1998, p. 49)

The question is how this interacts with quantification. The basic assumption in Heim and Kratzer (1998) about quantifiers is that they are relations between sets and total functions. The lexical entries for *every*, *some*, and *no* are given in (53).

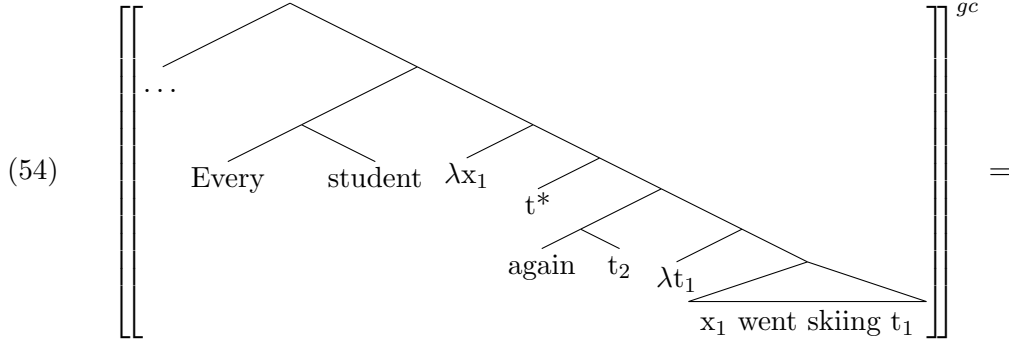
- (53)
- a. $\llbracket \text{every} \rrbracket = \lambda g_{\langle e,t \rangle} . \lambda f_{\langle e,t \rangle} . \{x: g(x)=1\} \subseteq \{x: f(x)=1\}$
 - b. $\llbracket \text{some} \rrbracket = \lambda g_{\langle e,t \rangle} . \lambda f_{\langle e,t \rangle} . \{x: g(x)=1\} \cap \{x: f(x)=1\} \neq \emptyset$
 - c. $\llbracket \text{no} \rrbracket = \lambda g_{\langle e,t \rangle} . \lambda f_{\langle e,t \rangle} . \{x: g(x)=1\} \cap \{x: f(x)=1\} = \emptyset$

Below is a sample calculation of a sentence with *again*.¹ Interestingly, if we assume the quantifier to be a total function, it does not matter whether either of its arguments is a partial function or not. Consequently, the whole sentence will not carry a PSP.²

¹The superscript *gc* is taken to mean that the interpretation function is interpreted relative to a contextual determined assignment function *g*

²Thanks to Sigrid Beck (p.c.) for pointing this out to me

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$$\begin{aligned}
& \llbracket \text{Every} \rrbracket^{gc} (\llbracket \text{student} \rrbracket^{gc}) (\llbracket \lambda x_1 t^* \text{ again } t_2 \lambda t_1 x_1 \text{ went skiing } t_1 \rrbracket^{gc}) = \\
& \llbracket \text{Every} \rrbracket^{gc} (\llbracket \text{student} \rrbracket^{gc}) (\lambda x_1 \llbracket \text{again} \rrbracket^{gc}(g(2))(\lambda t_1 \llbracket x_1 \text{ went skiing } t_1 \rrbracket^{gc})(t^*)) = \\
& \llbracket \text{Every} \rrbracket^{gc} (\lambda x.x \text{ is a student})(\lambda x_1 \llbracket \text{again} \rrbracket^{gc}(g(2))(\lambda t_1. x_1 \text{ went skiing at } t_1)(t^*)) = \\
& \llbracket \text{Every} \rrbracket^{gc} (\lambda x.x \text{ is a student}) (\lambda x_1. \lambda P_{\langle i, t \rangle}. \lambda t': g(2) < t' \ \& \ P(g(2)). P(t') (\lambda t_1. x_1 \text{ went} \\
& \text{skiing at } t_1)(t^*)) = \\
& \llbracket \text{Every} \rrbracket^{gc} (\lambda x.x \text{ is a student})(\lambda x_1: g(2) < t^* \ \& \ x_1 \text{ went skiing at } g(2). x_1 \text{ went skiing} \\
& \text{at } t^*) = \\
& \lambda g_{\langle e, t \rangle}. \lambda f_{\langle e, t \rangle}. \{x: g(x)=1\} \subseteq \{x: f(x)=1\} (\lambda x.x \text{ is a student})(\lambda x_1: g(2) < t^* \ \& \ x_1 \text{ went} \\
& \text{skiing at } g(2). x_1 \text{ went skiing at } t^*) = \\
& \{x: x \text{ is a student}\} \subseteq \{x: g(2) < t^* \ \& \ x \text{ went skiing at } g(2) \ \& \ x \text{ went skiing at } t^*\}
\end{aligned}$$

The compositional output above states that the sentence is only true if every student went skiing at a time before t^* and at t^* , and false if this is not the case. Assuming (53-b) as the lexical entry for *some*, the compositional output for a sentence with an existentially quantified subject will be true for a sentence like (54) if there is at least one student that went skiing before and at t^* , and false else.

Under this analysis, one could argue that the effects in the eye-tracking experiment are due to the fact that participants identified sentences with a universally quantified subject in the *two of three* context simply as false. However, this analysis also predicts that (54) with a subject headed by *no* is only true if there is no student who was skiing before t^* and at t^* . This seems to be problematic. Many people agree that such a sentence has at least an existential PSP (cf. Lerner and Zimmermann (1981), Beaver (1992), van der Sandt (1992)). In fact, the data in Chemla (2009) suggests that most people perceive even a universal PSP in this case.

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One way to remedy the prediction that quantified sentences end up presuppositionless is to assume that quantifiers are partial functions as well. This was suggested to me both by Sigrid Beck (p.c.) and Thomas Ede Zimmermann (p.c.). For existential statements, the reasoning is pretty straight forward: They are only defined if the intersection of both of the quantifier's arguments is defined. The lexical entry for an existential quantifier could thus look like (55). Such a lexical entry also presupposes that there is at least one x in the restrictor of which $g(x)$ is true. I think this is desirable (cf. Cooper (1983)).

$$(55) \quad \llbracket \text{some} \rrbracket = \lambda g_{\langle e,t \rangle} . \lambda f_{\langle e,t \rangle} : \{x: g(x)=1\} \cap \{x: f(x) \text{ is defined}\} \neq \emptyset . \{x: g(x)=1\} \cap \{x: f(x)=1\} \neq \emptyset$$

For a universal quantifier on the other hand, it is not obvious how the PSP looks like. Both lexical entries in (56-a) and (56-b) are conceivable. The former would result in an existential PSP, the latter in a universal one.

$$(56) \quad \begin{array}{l} \text{a.} \quad \llbracket \text{every} \rrbracket = \lambda g_{\langle e,t \rangle} . \lambda f_{\langle e,t \rangle} : \{x: g(x)=1\} \cap \{x: f(x) \text{ is defined}\} \neq \emptyset . \{x: g(x)=1\} \subseteq \{x: f(x)=1\} \\ \text{b.} \quad \llbracket \text{every} \rrbracket = \lambda g_{\langle e,t \rangle} . \lambda f_{\langle e,t \rangle} : \{x: g(x)=1\} \subseteq \{x: f(x) \text{ is defined}\} . \{x: g(x)=1\} \subseteq \{x: f(x)=1\} \end{array}$$

The intriguing idea about this analysis is that PSP projection out of quantified statements is no longer treated as a uniform phenomenon. The assumption that the projection behavior hinges on the lexical entry of the respective quantifier, can also account for the different intuitions about the projected PSPs in the literature and the empirical pattern presented in Chemla (2009).

As for the universal quantifier, the results of the present experiment suggest a lexical entry like (56-b). In essence, assuming (56-a) as the lexical entry for *every* would run into the same problems that Beaver's theory does. The fact that people experience processing difficulties when not all of the members of the restrictor set satisfy the PSP of the nuclear scope, speaks in favor of a universal PSP, as captured in (56-b).

Throughout this chapter, I have only focused on what the resulting PSP is when the PSP is triggered in the nuclear scope of a quantifier. In the theories of Heim (1983) and Beaver (1992), assumptions about what the resulting PSP is when the PSP trigger appears in the restrictor of a quantifier stay the same. That is, for a sentence like (57),

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Heim’s theory would still predict a universal (i.e. that every conference attendee owns a laptop) PSP while Beaver’s theory claims that the PSP is existential (that there exists at least one conference member who owns a laptop). As before, this is independent of the quantifier and the trigger chosen.

(57) Each of these conference attendees who used their laptop during a session asked a question.

In his second experiment, Chemla (2009) added sentences with PSPs triggered in the restrictor of the quantified subject NP. The results show that there are less universal inferences in these kind of sentences compared to the *every* and *no* sentences when the PSP was triggered in the nuclear scope. Most importantly, there were no significant differences depending on the quantifier chosen. Chemla concludes that “in the absence of effect, it is difficult to draw any firm conclusion for these cases” (Chemla, 2009, p. 17). This result is indeed surprising for a theory which treats PSP projection out of the nuclear scope of a quantifier and out of the restrictor on par. However, in the lexical entries for quantifiers proposed in this section, there is an asymmetry between the restrictor and the nuclear scope. This is most prominently seen in the suggested lexical entry for *every* repeated in (58).

(58) $\llbracket \text{every} \rrbracket = \lambda g_{\langle e,t \rangle} . \lambda f_{\langle e,t \rangle} : \{x: g(x)=1\} \subseteq \{x: f(x) \text{ is defined}\} . \{x: g(x)=1\} \subseteq \{x: f(x)=1\}$

We can see that this entry requires all individuals who make the restrictor of *every* true to be a subset of those individuals who satisfy the PSP of the nuclear scope. This yields a universal PSP for *every* when the PSP is triggered in the nuclear scope. On the basis of the results of the present experiment, this is the desired outcome. However, if the PSP is triggered in the restrictor, things change. In a sentence like (57), where there is no PSP triggered in the nuclear scope, the requirement that $f(x)$ is defined is trivially fulfilled. The resulting PSP is thus that those individual who make the restrictor true are a subset of all individuals, which is also trivially fulfilled. Hence the whole sentence in (57) presupposes, in essence, nothing. If anything, we want $g(x)$ to be true of at least one individual. This is why a sentence like (57) is odd when there is not conference attendee who owns a laptop. However, the same judgments applies

4.4 Experiment: Presuppositions in the Scope of Quantified NPs, Eye Tracking Data

to sentences in which there is no PSP introduced in the restrictor of the quantifier, as (59) shows.

(59) Every conference attendee had a question.

This sentence would also be very odd if there was no conference attendee at all. The fact that we do not like to quantify over empty domains has already been discussed in Strawson (1952), and more recently in Diesing (1990). There might thus be another PSP (at least for the quantifiers discussed here) which requires the restrictor set not to be empty. The lexical entry for *some* suggested above already takes care of this. For *every*, the lexical entry would have to be amended to (60) on the next page.

(60) $\llbracket \text{every} \rrbracket = \lambda g_{\langle e,t \rangle} . \lambda f_{\langle e,t \rangle} : \{x: g(x)=1\} \neq \emptyset \ \& \ \{x: g(x)=1\} \subseteq \{x: f(x) \text{ is defined}\} . \{x: g(x)=1\} \subseteq \{x: f(x)=1\}$

The suggested analysis is thus not only able to account for the observed reading time pattern when a PSP is triggered in the scope of a quantifier, it also models the intuitions (supported by the experimental data in Chemla (2009)) about PSPs which are triggered in the restrictor correctly. This shows that a dynamic semantic framework is not necessarily needed in order to account for the projection facts, specifically in the case of quantified statements. However, in order to be able to account for the very early effects of PSP failure observed in this and the other experiments discussed within this thesis, we cannot simply assume that semantic composition is static and that the meaning of a sentence is only derived after the whole sentence has been read or heard. The results presented here suggest that semantic processing is very incremental and that an interpretation is already assigned to sentence fragments. Thus, in order to come up with a realistic model of semantic interpretation, we have to assume that LFs are constructed and assigned an interpretation immediately. The fact that context sensitive expressions like PSPs lead to immediate effects also suggests that context is also considered very early on during sentence interpretation. In the next chapter, I will lay out a hypothesis how context is accessed during interpretation in a guided and economic manner. But first I would like to explore how the suggestion made here for quantifiers could be expanded to accommodate other projection environments.

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4.4.4.4 Extending the Analysis

If the analysis that PSP projection comes about by the PSPs of the respective operators is on the right track, it would be highly desirable if this was not only applicable to quantifiers, but to all other operators which are discussed in connection with the projection behavior of PSPs. One case in point are conjunctions and conditionals, both of which are traditionally assumed to be PSP filters (Karttunen, 1973). This is so, because they can seemingly filter out the PSP of their second argument, if their first argument entails it. This is exemplified by the sentences in (61) and (62).

- (61) a. It is true that Jack is married and all of Jack's children are bald. (**PSP**=Jack has children)
b. All of Jack's children are bald and Jack is married. (**PSP**=Jack has children)
c. It is true that Jack has children and all of Jack's children are bald. (no PSP)
- (62) a. If baldness is hereditary, then all of Jack's children are bald. (**PSP**=Jack has children)¹
b. If all of Jack's children are bald, then baldness is hereditary. (**PSP**=Jack has children)
c. If Jack has children, then all of Jack's children are bald. (no PSP)

It is easy to see that a lexical entry for *and* which demands that both of its arguments have to be defined in the context won't be able to account for the pattern observed here. Instead, we need a semantics for *and* which states that the first argument is defined in the context and that the second argument is defined in those worlds in which the first conjunct is true. Such an entry is given in (63).

- (63) $\llbracket \text{and} \rrbracket = \lambda p. \lambda q. \lambda w: p(w) \text{ is defined} \ \& \ \{w: p(w)=1\} \subseteq \{w: q(w) \text{ is defined}\}.$
 $p(w)=1 \ \& \ q(w)=1$

I am aware of the fact that such a lexical entry runs into the same problem that has often been discussed for the context change potentials of operators proposed by Heim

¹It is still controversial whether this is the right PSP, or if the PSP itself is conditional, like "If baldness is hereditary, then Jack has children". See discussion in Geurts (1996).

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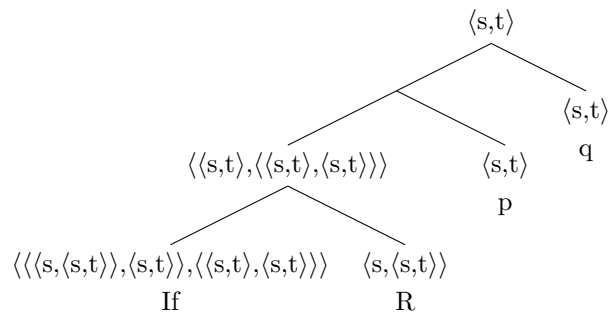
(1983). As Soames (1989) and Heim (1990, 1992) have noted, such an analysis makes it conceivable that there exists an operator which has exactly the same assertion, but a different PSP. For example, it could well be that the order of the arguments in the PSP is reversed, which would then predict that the PSPs of the first conjunct are filtered out when they are entailed by the second conjunct. This is not the case, as (64) shows. Sentences like this are considered odd at best. Most likely because the first conjunct forces accommodation, which makes the second conjunct superfluous.

(64) All of Jack's children are bald and Jack has children.

The fact that an analysis which roots the projection behavior of PSPs in the operator might overgenerate is a problem that my account shares with all other accounts along these lines. I will argue though that a lexical entry for these operators which reverses the order of arguments in the PSP is not feasible, because it would go against any incremental processing effort. I have mentioned above, and I will argue for this in detail in the next chapter, that meaning interpretation is highly incremental. Moreover, I am assuming that a PSP trigger signals that immediate access of the context is necessary. It would therefore be very inefficient, processing wise, to assume a lexical entry for an operator like *and* which demands that all arguments have been processed before the PSP can be evaluated. Thus, I take it that such a lexical entry would never be possible because of processing efficiency alone.

With this assumption in place, I would like to point out that the analysis presented here can also be extended to conditionals. Fintel and Heim (2011) analyse *if* as a quantifier over possible worlds. A LF is given in (65-a). The lexical entry that would be needed to capture the PSP filtering behavior of *if* is the one in (65-b).

(65) a.



b. $\llbracket \text{if} \rrbracket = \lambda R. \lambda p. \lambda q \lambda w: p(w) \text{ is defined} \ \& \ \{w: p(w)=1\} \subseteq \{w: q(w) \text{ is defined}\}.$
 $\{w': R(w)(w')=1\} \cap \{w': p(w') = 1\} \subseteq \{w': q(w') = 1\}$

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The lexical entry in (65-b) presupposes that the second argument of *if* (the antecedent) has to be defined and that the third argument (the consequence) has to be defined in those worlds, in which the second argument is true. This gives us the following PSPs for the sentences in (62).

- (66) a. If baldness is hereditary, then all of Jack’s children are bald.
PSP: $\{w: \text{baldness is hereditary in } w\} \subseteq \{w: \text{Jack has children in } w\}$
- b. If all of Jack’s children are bald, then baldness is hereditary.
PSP: Jack has children in w
- c. If Jack has children, then all of Jack’s children are bald.
PSP: $\{w: \text{Jack has children in } w\} \subseteq \{w: \text{Jack has children in } w\}$

The PSP in (66-c) is trivially fulfilled (and thus “filtered out”), while the PSPs in (66-a) and (66-b) still need to have some contextual support. This captures the observed pattern of the conditionals in (62).

4.5 Conclusion

This experiment was set up to test the two theories presented in Heim (1983) and Beaver (1992). These two theories are especially interesting because they make testable different predictions about the projection of PSPs triggered in the scope of quantified NPs. Both theories treat this as a uniform phenomenon and do not take differences between PSP triggers and quantifiers into account. The results of the presented eye-tracking experiment suggest that the choice of the trigger does indeed not have an impact on the projection behavior. However, reading measures differed significantly depending on the quantifier chosen. In sentences with the indefinite, context manipulation did not lead to differences in reading times. When the indefinite was replaced by a universal quantifier, reading measures increased in contexts where not all of the individuals satisfied the PSP.

I suggested that this pattern can be easily accounted for by the means of a well established semantic framework in the style of Heim and Kratzer (1998). The analysis I have presented here roots the source of the projection behavior in the lexical entry of the quantifier. This allows for variation depending on the quantifier chosen and is hence compatible with the results presented in Chemla (2009). Consequently, PSP

projection out of quantified statements is no longer treated as a uniform phenomenon. I have further argued that such an analysis can also account for the asymmetry in judgments between sentences when a PSP is introduced in the restrictor of a quantifier and sentence with a PSP in the nuclear scope.

I have also shown that such an analysis should and can be extended to other environments which give rise to PSP projection, such as conjunction and conditionals.

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5

Conclusion and Future Research

5.1 Discussion

This thesis set out to investigate the processing of a presuppositional element like *again* in various environments and in contrast to other PSP inducing items. In a first step, German *wieder* ('again') was presented in simple affirmative sentences. The context was manipulated in such a way that it either furnished the PSP of *again* or not. In order to investigate how people interpret a sentence with *again* when its PSP is not given in the context, reading times and question data were collected. The experiment brought several interesting aspects to light. First, that the PSP of *again* is processed as early as there is enough information about what the PSP is. Second, that the PSP of *again* is not accommodated by participants in an experiment, and third that variable assignment seems to be an costly task for the processor. On the basis of these results, I proposed the interpretation maxim *Minimize Accommodation* which states that accommodation is a last resort operation which is only applied if there is no other way of avoiding PSP failure. In the case of *again*, it seems to be easier to ignore the trigger because it is not necessary for the interpretation of the assertion. For other triggers like *know*, *stop* and the definite determiner, this is not possible and thus accommodation has to be applied. Additionally, I suggested a two step interpretation model for anaphoric triggers like *again*. The proposed model closely resembles models for pronoun resolution as suggested in Garrod and Sanford (1994), Garrod and Terras (2000), Sanford et al. (1983), Sturt (2003) among others. PSP triggers like *again*, *too*, and *stop* and pronouns are all anaphoric in nature. The sketched out parallel in

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processing strategies for well investigated referential phenomena like pronouns on the one hand and PSPs on the other hand is a promising one. First, it can give us a handle on less well understood phenomena such as PSPs. Second, it might lead to a more general processing model in which similar grammatical phenomena can be linked to similar processing strategies.

The second experiment tested the predictions that were derived from the results in the first experiment and contrasted them with a pragmatic classification of PSP triggers. The results of this experiment provided support for a semantic treatment of PSPs, supplemented by the hypotheses deduced on the basis of the results of the first experiment. Moreover, the experiment unveiled other interesting issues. The analysis of reading times for sentences with *know* showed that there are two types of interpreters. Those who process the PSP as soon as all the relevant information about the PSP except from tense are obvious, and those who delay the processing until they encounter the tensed verb. These different type of processors are very similar to the ‘energetic’ and ‘lazy’ readers reported in Koornneef (2008). In his experiment, ‘energetic’ readers were the ones that assigned a free or bound variable interpretation right away whereas the ‘lazy’ readers delayed this decision to a later point. This observation and the one made in the second experiment of this dissertation strongly suggest that there are different types of interpreters and that the question of how incremental the semantic parser is can thus not receive a general answer. However, the results of the second experiment also show that PSPs are processed very early on and as soon as there is enough evidence about what the PSP of a sentence will be.

A second issue which the experiment presented in the third chapter brought to light is the question of how accommodation is reflected in online processing. There was always an increase in reading times when the PSP of a sentence was not explicitly verified or falsified by the context. It is not exactly clear, however, what these reading time effects reflect. In the first experiment, reading times were also longer in the neutral condition, but the question data showed that this was not due to accommodation. There is hence no direct evidence that the increase in reading times observed in the second experiment is caused by accommodation or simply a reflection of the fact that people realized that they had to deal with an unsatisfied PSP. I will therefore conclude that accommodation exists (as shown by Domaneschi et al. (2013)), but that we lack yet an online measure that is sensitive enough to detect accommodation. ERPs might be

a promising candidate to identify accommodation. Burkhardt (2006) takes the P600 present in her experiment to signify discourse integration. This, in the words of a theory of PSPs, could be accommodation. In order to settle the debate when a PSP is accommodated, it might be thus fruitful for future research to investigate a variety of PSP triggers using ERP.

The fourth chapter dealt with the issue of PSP projection out of quantified environments. To this end, the two theories discussed in Heim (1983) and Beaver (1992) were presented. Both approaches make different predictions for the projection behavior of PSPs irrespective of the quantifier or trigger chosen. The discussed experiment tested these predictions for *again* and the definite in the scope of an existentially and a universally quantified subject NP. The results indicate that it makes a difference which quantifier is chosen. A result incompatible with either theory. On the basis of this result, I suggested an analysis in the framework of Heim and Kratzer (1998) which takes the contribution of the quantifier into account. Under this analysis, quantifiers themselves introduce a new PSP which leads to the observed projection pattern. Such an analysis does not treat PSP projection as a uniform phenomenon and is can easily account for the quantifier-dependent judgments presented in Chemla (2009).

In the following two sections I will discuss in detail what impact these findings have for a theory of presuppositions and a theory of semantic processing, respectively.

5.1.1 Implications for the Theory of Presuppositions

On the basis of the results presented in this thesis, I have made a couple of theoretical claims that have an impact on how PSPs are modeled and on how the projection behavior can be understood.

One of the main points I have argued for in this thesis is the deviation of PSP triggers into (at least) two classes on the basis of their semantic properties. The results of the first experiment served as a starting point for this analysis. I have accounted for the missing accommodation of the PSP introduced by *again* by postulating a preference for ignoring the trigger over accommodating its PSP, if possible. However, this is only possible for trigger like *again*, *too*, and *even*, because their semantic contribution to the assertion is the identity function only. This makes ignoring them innocuous for the overall interpretation of the sentence they occur in. I have called these kinds of triggers the **Class One** triggers. For **Class Two** triggers on the other hand, ignoring them is

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not an option, because they make a contribution to the literal meaning of the sentence. Without them, semantic interpretation could not proceed and the sentence they occur in would end up without a sensible meaning. In particular, I have argued that *stop*, *know*, and the definite article belong to this class of triggers. Yet, there might be other semantic properties on the basis of which this class can be broken down into further classes. The second experiment showed that sentences with *stop* were processed very differently from all other sentences containing a PSP trigger. I have argued that this is due to the fact that *stop* is a Class Two trigger on the one hand, but that it is also referential - just like *again* - on the other hand. Being a Class Two trigger, *stop* cannot be ignored, and thus variable assignment has to take place immediately. This is reflected in the long reading times on the critical word in the positive condition in the second experiment. This fine grained distinction between different PSP triggers on the basis of their semantic properties is new and different from other suggestions in the literature, like for example the often discussed distinction between hard and soft triggers. One major point in which the categorization suggested in this thesis differs from other theories is that I assume that all PSPs are encoded semantically. In recent years, differences between different triggers have often been discussed in terms of *semantic* and *pragmatic* triggers (see e.g. Abusch (2002, 2009), Simons (2001), among others). I propose that each lexical expression which we consider to be a PSP trigger, carries the PSP in its meaning. This is what signals the processor to check the context for the relevant PSP and enables rapid processing of the PSP. In the next section, I will lay out in detail how this impacts the processing of a sentence with a presupposition.

Throughout this thesis I have assumed the theoretical framework of Heim and Kratzer (1998), but I have also shown that the standard textbook analysis of quantifiers and other operators as total functions run into problems when trying to account for the projection behavior of PSPs.¹ In chapter 4, I have suggested to amend this shortcoming by assuming that these operators are partial functions themselves. This does not only help us capturing the projection facts observed, it has also the great advantage that it does not treat the projection of a PSP out of the nuclear scope of a quantifier as a unified phenomenon. By tying the projection behavior to the lexical entry of the

¹Even though Heim and Kratzer (1998) discuss the possibility of presuppositional quantifiers, but not to the extend suggested in this thesis.

respective quantifier, we are able to account for the fact that different quantifiers give rise to different PSPs, as the experiments in chapter 4 have shown.

However, the immediate online effects in PSP processing have also made it clear that a static semantic framework won't do. I am therefore suggesting that compositional interpretation happens incrementally. A new lexical element is integrated into the LF as soon as it is possible, and a presupposition is checked against the context at the point at which the PSP is fully known. The next section is devoted to the discussion of how I assume semantic interpretation to proceed.

5.1.2 Implications for a Semantic Processing Theory

In this section, I will discuss the impact that the results presented in this thesis have on the formulation of a semantic processing model. I will do so by first talking about the specific results obtained in the experiments discussed herein. In a second step, I will abstract away from these and discuss the perspective these results offer for a semantic processing model. The first experiment revealed that the presupposition of a trigger like *again* is not accommodated when presupposition failure occurs. On the basis of this result, I have suggested that *again* is only fully interpreted once the relevant proposition (i.e., the proposition that makes the PSP of *again* true) can be verified. This means that a value assignment for the free temporal variable which serves as *again*'s first argument is only considered once the PSP is known to be true. If the PSP turns out not to be verified, *again* will be deleted from the LF. This can be done, because *again* does only denote the identity function on the assertoric level, i.e., no revision of the assertion is necessary. For a Class Two trigger on the other hand, such a kind of revision is not possible, because Class Two triggers - in contrast to Class One triggers - do make a contribution to the literal meaning of the sentence. Therefore, Class Two triggers have to be fully integrated and interpreted immediately. This is supported by the reading times observed for sentences with *stop* in the third chapter. In contrast to all other triggers, *stop* received the longest reading times on the critical word in the positive condition (and not in the neutral condition). I have argued that this is due to the fact that *stop* is immediately interpreted, which means that as soon as the PSP of *stop* is revealed to the reader, variable assignment takes place. This is reflected in the long reading times on the critical word.

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The results of the experiment presented in the fourth chapter, suggest that sentences with a PSP triggered in the nuclear scope of a universal quantifier project universally. For sentences with an existentially quantified subject NP, this is not the case. The experiments in chapter two and three have shown that PSP failure leads to an immediate increase in reading times on the critical word, or earlier if there was enough independent evidence to determine what the PSP was going to be. For the quantified sentences, however, reading times came apart one word after the critical word. It is very unlikely that the delay of the effect is due to the fact that this experiment used eye tracking instead of self-paced reading, because eye tracking is more natural and faster than self-paced reading.¹ This delayed effect also corroborates the findings in Schwarz and Tiemann (2012) who argue that PSP projection takes time in processing. I have argued here that the projection facts can be captured if we assume operators which give rise to projection phenomena to introduces PSPs themselves which then in turn lead to the observed projection pattern. This means that for projection to happen, two PSPs have to be considered and evaluated in parallel. This adds extra complexity for the processor and makes PSPs in projecting environments harder to process. An analysis along these lines suggest that adding more operators onto a presuppositional sentence will increase processing difficulties. In Schwarz and Tiemann (2014) we report several experiments where we varied the depth of embedding of *again*, and the results suggest that every extra layer of embedding makes PSP evaluation harder to process. So the assumption that extra operators increase the difficulty in processing is borne out.

On a general note, the experiments discussed in this thesis show that PSPs are steadily evaluated against the given context. As soon as an inconsistency with the context is detected, this conflict shows up in reading times. For most of the presupposition triggers looked at, this was the word at which the PSP was fully known to the reader. However, I have also argued on the basis of the findings for *again* and the definite article in the second experiment that cues such as subject NPs of which the PSP cannot hold and mismatching gender features can lead to earlier effects. This means that readers are to a certain degree predictive in sentence interpretation. Frazier (1999) suggested that the parser can make immediate use of the context in semantic interpretation. However, this is only done in a guided manner, if there is enough reason

¹See e.g. Clifton (2013) who finds immediate effects in eye tracking which became only apparent on the spillover region in a self-paced reading experiment.

to do so. I would like to argue here that the occurrence of a PSP trigger is such a cue which signals the parser that s/he has to consult the context. On the basis of Frazier’s (1999) observation, Dickey (2000) formulated the *anaphoric cue hypothesis* in (1).

(1) **Anaphoric Cue Hypothesis (ACH)**

Each linguistic expression which introduces a free variable into the semantic representation initiates a search of preceding context for a value for that variable.

The experiments in this thesis have shown that this principle has to be expanded to accommodate the fast interpretation of PSPs, since I do not assume that every PSP trigger introduces a free variable. I will therefore argue that there is an even more general principle which encompasses every context sensitive expression. The prime candidates for context dependent expressions are free variables and presuppositions.

(2) **The Context Dependence Hypothesis (CDH)¹**

Each linguistic expression whose interpretation is context sensitive initiates a search of the preceding context to receive an interpretation.

According to this hypothesis, expressions which make reference to the context, trigger an immediate context search. This means that as soon as a PSP trigger is encountered, contextual information is considered during sentence interpretation. Note that they way in which free variables and PSPs are evaluated is quite different, though. In the framework I am considering here, free variables receive their value through the variable assignment function. A PSP demands that a certain proposition is part of the common ground. In order to check whether a PSP is entailed by a certain context, one has to has to know what the presupposed proposition is. To be more precise, I suggest that the incremental interpretation of a sentence like (3) precedes as in (4), assuming that the processor encounters the sentence word-by-word.²³

¹This is an extension of Villalta’s (2007) Context Dependence Hypothesis. Her CDH is geared towards accommodating the specific issue of *how many*-questions. The CDH proposed here is more general.

²For ease of presentation, I am using present tense and assume that there is no dedicated PRESENT operator. I am assuming that the only contribution of the auxiliary *ist* is adding this temporal information.

³This derivation is heavily inspired by my discussions with Sigrid Beck (p.c.) and Beck (2014)

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- (3) Susanne ist wieder Schlittschuhlaufen
Susanne is again ice-skating
- (4) a. [Susanne [ist ...
projected meaning:
 $\lambda P_{\langle e, \langle i, t \rangle \rangle} \cdot \llbracket P \rrbracket (\llbracket \text{Susanne} \rrbracket) (t_{now})$
- b. [Susanne [ist [wieder t₁...
projected meaning:
 $\lambda P_{\langle e, \langle i, t \rangle \rangle} : t_1 < t_{now} \ \& \ \llbracket P \rrbracket (\llbracket \text{Susanne} \rrbracket) (t_1) \cdot \llbracket P \rrbracket (\llbracket \text{Susanne} \rrbracket) (t_{now})$
- c. [Susanne [ist [wieder [Schlittschuhlaufen]]]]
check if t₁ < t_{now} & S. was ice-skating at t₁
yes, then S. is ice-skating at t_{now}

The step illustrated in (4-b) is of special importance. At this point, only the name *Susanne*, the auxiliary and *wieder* ('again') have been encountered. As many studies on subject-object ambiguities have shown (e.g. Bader and Meng (1999); Schlesewsky et al. (2000); Schlesewsky and Friederici (2003)), the first noun in a sentence is always assigned the role of the subject. *Susanne* is thus predicted to be the subject of whatever *P* denotes. This means that if *Susanne* was not mentioned in the previous context (just like in the **neutral condition** in the experiment presented in chapter 3), the context search that is triggered by *wieder* cannot return a suitable predicate for *P*. So it is already clear at this point, that whatever *P* is, the PSP of (3) will not be met. This explains the early effects for *wieder* in the experiment discussed in chapter 3. Note that the model presented here assumes predictive processing. I suggest that even when the verb is not yet encountered, a bound variable of type $\langle e, \langle i, t \rangle \rangle$ is projected which will later on be filled with the verb denotation. At the step illustrated in (4-c), the PSP is fully known to the speaker and it is either supported by the context or not. If there is a suitable proposition in the context, t₁ is assigned a value.

5.1.3 Future Research

The experiments presented in this dissertation have unveiled many interesting aspects concerning the processing of PSPs and beyond. While many questions have been answered, some things have been uncovered that remain yet to be solved. One of the issues that came up is the missing evidence for accommodation in online processing.

Even though all the experiments presented here revealed that there are processing difficulties when the PSP of a sentence is not given in the context, it is not obvious that this can be taken as evidence for accommodation. I think we have to conclude that reading time data is not sensitive enough to capture a process such as accommodation. On the basis of the results reported in Burkhardt (2006), I am hopeful that ERPs can help us to get a better grasp of this phenomenon. It would thus be highly interesting to test whether Class One triggers (*too*, *again*) evoke a different ERP pattern than Class Two trigger (*stop*, *know* and the definite determiner).

Further research will also have to be conducted on a broader variety of quantifiers as to see what exactly they presuppose. In connection to this, it would be interesting to investigate the interaction of different triggers and different quantifiers. Even though there was no obvious difference between quantified sentences with *again* and the definite determiner in online processing, there might be a difference in how these sentences are interpreted when their PSPs are not met. It is for example perceivable that a sentence in which a Class One trigger is in the scope of a universally quantified subject is reinterpreted so as to presuppose nothing when their PSP is not given in the context. That is, if the PSP of *again* in (5-a) is not given in the context, *again* is ignored and the sentence is understood as meaning (5-b) only.

- (5) a. Every student smiled again.
b. Every student smiled.

Or maybe there is something about the quantifier which makes it impossible to ignore a Class One trigger. It would also be interesting to see how a sentence like (6) is interpreted where ignoring the definite determiner is not an option.

- (6) Every student kicked his laptop.

Do people accommodate globally in a neutral context? Is there something like local accommodation (in the form of quantifier restriction)? These are questions that future research will have to answer.

On a more general note, I have argued alongside Koornneef (2008) that there are differences between people in how fast they assign an interpretation to a string of words. This is something that future research will have to take into account in order to come up with a realistic modeling of the semantic parser.

5. CONCLUSION AND FUTURE RESEARCH

6

Appendix

6.1 Material Used in the First Experiment

- (1)
 - a.
 - (i) Letzte Woche hat Linda Judith eine rosa Lampe für ein Zimmer gekauft.
 - (ii) Letzte Woche hat Judith Linda eine rosa Lampe für ein Zimmer gekauft.
 - b.
 - (i) Vor zwei Tagen hat {Judith/Linda} wieder eine rosa Lampe erhalten, als sie mit einer Freundin unterwegs war.
 - (ii) Vor zwei Tagen hat {Judith/Linda} wieder eine rosa Lampe besorgt, als sie mit einer Freundin unterwegs war.
- (2)
 - a.
 - (i) Letztes Jahr hat Linda Timo ein schönes Geschenk zum Geburtstag gebastelt.
 - (ii) Letztes Jahr hat Timo Linda ein schönes Geschenk zum Geburtstag gebastelt.
 - b.
 - (i) Vor einer Woche hat {Timo/Linda} wieder ein schönes Geschenk empfangen, weil {er/sie} bei einer Wichtelaktion mitgemacht hat.
 - (ii) Vor einer Woche hat {Timo/Linda} wieder ein schönes Geschenk gemacht, weil {er/sie} bei einer Wichtelaktion mitgemacht hat.
- (3)
 - a.
 - (i) Letztes Jahr hat Linda Thorsten ein selbstgeschriebenes Lied vorgesungen.

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- (ii) Letztes Jahr hat Thorsten Linda ein selbstgeschriebenes Lied vorgesungen.
 - b.
 - (i) Vor drei Wochen hat {Linda/Thorsten} wieder ein selbstgeschriebenes Lied gehört, als {sie/er} bei einer Freundin daheim war.
 - (ii) Vor drei Wochen hat {Linda/Thorsten} wieder ein selbstgeschriebenes Lied gesungen, als {sie/er} bei einer Freundin daheim war.
- (4)
- a.
 - (i) Vorletzte Woche hat Linda Karl eine rote Rose geschenkt.
 - (ii) Vorletzte Woche hat Karl Linda eine rote Rose geschenkt.
 - b.
 - (i) Vor vier Tagen hat {Linda/Karl} wieder eine rote Rose bekommen, als {sie/er} zu einem Date verabredet war.
 - (ii) Vor vier Tagen hat {Linda/Karl} wieder eine rote Rose vergeben, als {sie/er} zu einem Date verabredet war.
- (5)
- a.
 - (i) Vor drei Wochen hat Linda Greta einen langen Brief geschrieben.
 - (ii) Vor drei Wochen hat Greta Linda einen langen Brief geschrieben.
 - b.
 - (i) Vor einer Woche hat {Greta/Linda} wieder einen langen Brief empfangen, weil sie auf eine Anzeige geantwortet hat.
 - (ii) Vor einer Woche hat {Greta/Linda} wieder einen langen Brief verfasst, weil sie auf eine Anzeige geantwortet hat.
- (6)
- a.
 - (i) Vor zwei Monaten hat Judith für Tina einen leckeren Kuchen gebacken.
 - (ii) Vor zwei Monaten hat Tina für Judith einen leckeren Kuchen gebacken.
 - b.
 - (i) Vor zwei Wochen hat {Tina/Judith} wieder einen leckeren Kuchen erhalten, weil sie zu einer Party eingeladen hatte.
 - (ii) Vor zwei Wochen hat {Tina/Judith} wieder einen leckeren Kuchen gemacht, weil sie zu einer Party eingeladen hatte.
- (7)
- a.
 - (i) Vor einer Woche hat Judith für Sabine eine fetzige CD zusammengestellt.
 - (ii) Vor einer Woche hat Sabine für Judith eine fetzige CD zusammengestellt.
 - b.
 - (i) Vor drei Tagen hat {Sabine/Judith} wieder eine fetzige CD bekommen, weil sie bei einer Tauschaktion mitgemacht hat.
 - (ii) Vor drei Tagen hat {Sabine/Judith} wieder eine fetzige CD gebrannt, weil sie bei einer Tauschaktion mitgemacht hat.

6.1 Material Used in the First Experiment

- (8) a. (i) Letzten Monat hat Judith bei Linda eine neue Blume im Garten eingepflanzt.
(ii) Letzten Monat hat Linda bei Judith eine neue Blume im Garten eingepflanzt.
- b. (i) Vor einer Woche hat {Linda/Judith} wieder eine neue Blume bekommen, weil sie von einer Rosensorte begeistert ist.
(ii) Vor einer Woche hat {Linda/Judith} wieder eine neue Blume eingegraben, weil sie von einer Rosensorte begeistert ist.
- (9) a. (i) Vor einem Jahr hat Judith für Timo ein teures Konzertticket bestellt.
(ii) Vor einem Jahr hat Timo für Judith ein teures Konzertticket bestellt.
- b. (i) Vor vier Wochen hat {Timo/Judith} wieder ein teures Konzertticket bekommen, weil {sie/er} mit einem Freund feiern will.
(ii) Vor vier Wochen hat {Timo/Judith} wieder ein teures Konzertticket erworben, weil {sie/er} mit einem Freund feiern will.
- (10) a. (i) Letztes Semester hat Greta Judith einen kleinen Spickzettel zukommen lassen.
(ii) Letztes Semester hat Judith Greta einen kleinen Spickzettel zukommen lassen.
- b. (i) Vor fünf Tagen hat {Judith/Greta} wieder einen kleinen Spickzettel erhalten, als sie an einer Klausur teilgenommen hat.
(ii) Vor fünf Tagen hat {Judith/Greta} wieder einen kleinen Spickzettel weitergegeben, als sie an einer Klausur teilgenommen hat.
- (11) a. (i) Vor zwei Monaten hat Thorsten Linda ein interessantes Jobangebot offeriert.
(ii) Vor zwei Monaten hat Linda Thorsten ein interessantes Jobangebot offeriert.
- b. (i) Vor zwei Tagen hat {Linda/Thorsten} wieder ein interessantes Jobangebot bekommen, als {sie/er} auf einer Jobbörse zugegen war.
(ii) Vor zwei Tagen hat {Linda/Thorsten} wieder ein interessantes Jobangebot gemacht, als {sie/er} auf einer Jobbörse zugegen war.

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- (12) a. (i) Vor drei Jahren hat Thorsten für Timo einen großen Kleiderschrank gekauft.
(ii) Vor drei Jahren hat Timo für Thorsten einen großen Kleiderschrank gekauft.
- b. (i) Vor einer Woche hat {Timo/Thorsten} wieder einen großen Kleiderschrank bekommen, weil er mit einem Freund ausgemistet hat.
(ii) Vor einer Woche hat {Timo/Thorsten} wieder einen großen Kleiderschrank weggegeben, weil er mit einem Freund ausgemistet hat.
- (13) a. (i) Letzte Woche hat Thorsten Greta mit einem spannenden Auftrag betreut.
(ii) Letzte Woche hat Greta Thorsten mit einem spannenden Auftrag betreut.
- b. (i) Vor zwei Tagen hat {Greta/Thorsten} wieder einen spannenden Auftrag ausgeführt, als {sie/er} an einer Konferenz teilgenommen hat.
(ii) Vor zwei Tagen hat {Greta/Thorsten} wieder einen spannenden Auftrag vergeben, als {sie/er} an einer Konferenz teilgenommen hat.
- (14) a. (i) Letzten Monat hat Thorsten Sabine ein selbstgemaltes Bild gezeigt.
(ii) Letzten Monat hat Sabine Thorsten ein selbstgemaltes Bild gezeigt.
- b. (i) Vor zwei Wochen hat {Sabine/Thorsten} wieder ein selbstgemaltes Bild gesehen, als {sie/er} mit einer Künstlerin verabredet war.
(ii) Vor zwei Wochen hat {Sabine/Thorsten} wieder ein selbstgemaltes Bild präsentiert, als {sie/er} mit einer Künstlerin verabredet war.
- (15) a. (i) Vor vier Wochen hat Thorsten Tina angeschrien.
(ii) Vor vier Wochen hat Tina Thorsten angeschrien.
- b. (i) Vor drei Tagen hat {Tina/Thorsten} wieder eine lautstarke Standpauke bekommen, als {sie/er} an einer Bushaltestelle gewartet hat.
(ii) Vor drei Tagen hat {Tina/Thorsten} wieder eine lautstarke Standpauke gehalten, als {sie/er} an einer Bushaltestelle gewartet hat.
- (16) a. (i) Vor vier Monaten hat Greta Sabine ein tragisches Gedicht vorgetragen.

6.1 Material Used in the First Experiment

- (ii) Vor vier Monaten hat Sabine Greta ein tragisches Gedicht vorgetragen.
 - b.
 - (i) Vor zwei Tagen hat {Sabine/Greta} wieder ein tragisches Gedicht gehört, als sie bei einem Kleinkunstabend zugegen war.
 - (ii) Vor zwei Tagen hat {Sabine/Greta} wieder ein tragisches Gedicht rezitiert, als sie bei einem Kleinkunstabend zugegen war.
- (17)
- a.
 - (i) Vor zwei Monaten hat Greta vor Tina einen komplizierten Vortrag gehalten.
 - (ii) Vor zwei Monaten hat Tina vor Greta einen komplizierten Vortrag gehalten.
 - b.
 - (i) Vor drei Tagen hat {Tina/Greta} wieder einen komplizierten Vortrag gehört, als sie auf einer Tagung gewesen ist.
 - (ii) Vor drei Tagen hat {Tina/Greta} wieder einen komplizierten Vortrag präsentiert, als sie auf einer Tagung gewesen ist.
- (18)
- a.
 - (i) Vor einer Woche hat Greta Thorsten einen Cocktail ausgegeben.
 - (ii) Vor einer Woche hat Thorsten Greta einen Cocktail ausgegeben.
 - b.
 - (i) Vor vier Tagen hat {Thorsten/Greta} wieder einen leckeren Cocktail bekommen, als {er/sie} in einer Bar gewesen ist.
 - (ii) Vor vier Tagen hat {Thorsten/Greta} wieder einen leckeren Cocktail bezahlt, als {er/sie} in einer Bar gewesen ist.
- (19)
- a.
 - (i) Vor zwei Wochen hat Greta Judith ein Kompliment gemacht.
 - (ii) Vor zwei Wochen hat Judith Greta ein Kompliment gemacht.
 - b.
 - (i) Vor einer Woche hat {Judith/Greta} wieder ein nettes Kompliment erhalten, als sie in einem Park spazieren war.
 - (ii) Vor einer Woche hat {Judith/Greta} wieder ein nettes Kompliment verteilt, als sie in einem Park spazieren war.
- (20)
- a.
 - (i) Vor drei Monaten hat Greta Karl ein französisches Lied beigebracht.
 - (ii) Vor drei Monaten hat Karl Greta ein französisches Lied beigebracht.
 - b.
 - (i) Vor zwei Wochen hat {Karl/Greta} wieder ein französisches Lied gelernt, als {er/sie} mit einem Freund unterwegs war.

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- (ii) Vor einer Woche hat {Judith/Greta} wieder ein nettes Kompliment verteilt, als {er/sie} in einem Park spazieren war.
- (21)
 - a.
 - (i) Letztes Jahr hat Tina Timo eine Überraschungsparty zum bestandenen Examen organisiert.
 - (ii) Letztes Jahr hat Timo Tina eine Überraschungsparty zum bestandenen Examen organisiert.
 - b.
 - (i) Vor vier Monaten hat {Timo/Tina} wieder eine große Überraschungsparty bekommen, weil {er/sie} in einem Preisausschreiben gewonnen hatte.
 - (ii) Vor vier Monaten hat {Timo/Tina} wieder eine große Überraschungsparty ausgerichtet, weil {er/sie} in einem Preisausschreiben gewonnen hatte.
- (22)
 - a.
 - (i) Vor vier Wochen hat Tina Greta von einer albernem Geschichte aus ihrem Leben berichtet.
 - (ii) Vor vier Wochen hat Greta Tina von einer albernem Geschichte aus ihrem Leben berichtet.
 - b.
 - (i) Vor zwei Tagen hat {Greta/Tina} wieder eine alberne Geschichte gehört, als sie auf einer Geburtstagsparty eingeladen war.
 - (ii) Vor zwei Tagen hat {Greta/Tina} wieder eine alberne Geschichte erzählt, als sie auf einer Geburtstagsparty eingeladen war.
- (23)
 - a.
 - (i) Vor einer Woche hat Tina Sabine wütend gemacht.
 - (ii) Vor einer Woche hat Sabine Tina wütend gemacht.
 - b.
 - (i) Vor zwei Tagen hat {Sabine/Tina} wieder einen kleinen Wutanfall bekommen, als sie an einer Schlange anstehen musste.
 - (ii) Vor zwei Tagen hat {Sabine/Tina} wieder einen kleinen Wutanfall provoziert, als sie an einer Schlange anstehen musste.
- (24)
 - a.
 - (i) Letzten Monat hat Tina Thorsten ein Lied gewidmet.
 - (ii) Letzten Monat hat Thorsten Tina ein Lied gewidmet.
 - b.
 - (i) Vor einer Woche hat {Thorsten/Tina} wieder eine nette Widmung bekommen, weil {er/sie} an einem Song mitgearbeitet hat.
 - (ii) Vor einer Woche hat {Thorsten/Tina} wieder eine nette Widmung geschrieben, weil {er/sie} an einem Song mitgearbeitet hat.

6.1 Material Used in the First Experiment

- (25) a. (i) Vor vier Wochen hat Tina vor Karl einen lustigen Sketch aufgeführt.
(ii) Vor vier Wochen hat Karl vor Tina einen lustigen Sketch aufgeführt.
b. (i) Vor zwei Wochen hat {Karl/Tina} wieder einen lustigen Sketch gesehen, als {er/sie} auf einem Comedyfestival gewesen ist.
(ii) Vor zwei Wochen hat {Karl/Tina} wieder einen lustigen Sketch dargeboten, als {er/sie} auf einem Comedyfestival gewesen ist.
- (26) a. (i) Vorletzten Monat hat Sabine Tina eine neue Gitarrensaite besorgt.
(ii) Vorletzten Monat hat Tina Sabine eine neue Gitarrensaite besorgt.
b. (i) Vor drei Tagen hat {Tina/Sabine} wieder eine neue Gitarrensaite erhalten, als sie mit einem Freund einkaufen war.
(ii) Vor drei Tagen hat {Tina/Sabine} wieder eine neue Gitarrensaite gekauft, als sie mit einem Freund einkaufen war.
- (27) a. (i) Letzten Monat hat Sabine Thorsten ein schweres Paket gebracht.
(ii) Letzten Monat hat Thorsten Sabine ein schweres Paket gebracht.
b. (i) Vor einer Woche hat {Thorsten/Sabine} wieder ein schweres Paket entgegengenommen, während {er/sie} an eine Geburtstagsparty gedacht hat.
(ii) Vor einer Woche hat {Thorsten/Sabine} wieder ein schweres Paket abgegeben, während {er/sie} an eine Geburtstagsparty gedacht hat.
- (28) a. (i) Letztes Jahr hat Sabine Karl einen guten Wein per Post geschickt.
(ii) Letztes Jahr hat Karl Sabine einen guten Wein per Post geschickt.
b. (i) Vor zwei Monaten hat {Karl/Sabine} wieder einen guten Wein empfangen, weil {er/sie} bei einem Weinhändler eingekauft hat.
(ii) Vor zwei Monaten hat {Karl/Sabine} wieder einen guten Wein versendet, weil {er/sie} bei einem Weinhändler eingekauft hat.
- (29) a. (i) Vergangene Woche hat Sabine Judith eine knusprige Brezel vom Bäcker mitgebracht.
(ii) Vergangene Woche hat Judith Sabine eine knusprige Brezel vom Bäcker mitgebracht.
b. (i) Vor zwei Tagen hat {Judith/Sabine} wieder eine knusprige Brezel bekommen, als sie auf einer Lebensmittelmesse unterwegs war.

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- (ii) Vor zwei Tagen hat {Judith/Sabine} wieder eine knusprige Brezel besorgt, als sie auf einer Lebensmittelmesse unterwegs war.
- (30)
 - a.
 - (i) Vor zwei Wochen hat Sabine Linda angelogen.
 - (ii) Vor zwei Wochen hat Linda Sabine angelogen.
 - b.
 - (i) Vor vier Tagen hat {Linda/Sabine} wieder eine gemeine Lüge gehört, als sie an einem Streit beteiligt war.
 - (ii) Vor vier Tagen hat {Linda/Sabine} wieder eine gemeine Lüge erzählt, als sie an einem Streit beteiligt war.
- (31)
 - a.
 - (i) Vor drei Wochen hat Timo Judith massiert.
 - (ii) Vor drei Wochen hat Judith Timo massiert.
 - b.
 - (i) Vor vier Tagen hat {Judith/Timo} wieder eine wohltuende Massage bekommen, während {sie/er} mit einer Freundin gelernt hat.
 - (ii) Vor vier Tagen hat {Judith/Timo} wieder eine wohltuende Massage gegeben, während {sie/er} mit einer Freundin gelernt hat.
- (32)
 - a.
 - (i) Vor drei Monaten hat Timo Linda ein weißes Bücherregal gebaut.
 - (ii) Vor drei Monaten hat Linda Timo ein weißes Bücherregal gebaut.
 - b.
 - (i) Vor zwei Wochen hat {Linda/Timo} wieder ein weißes Bücherregal geschreinert, weil {sie/er} in eine WG gezogen ist.
 - (ii) Vor zwei Wochen hat {Linda/Timo} wieder ein weißes Bücherregal erhalten, weil {sie/er} in eine WG gezogen ist.
- (33)
 - a.
 - (i) Letzten Monat hat Timo Greta ein peinliches Geheimnis verraten.
 - (ii) Letzten Monat hat Greta Timo ein peinliches Geheimnis verraten.
 - b.
 - (i) Vor drei Tagen hat {Greta/Timo} wieder ein peinliches Geheimnis erfahren, als {sie/er} an einem Klassentreffen teilgenommen hat.
 - (ii) Vor drei Tagen hat {Greta/Timo} wieder ein peinliches Geheimnis preisgegeben, als {sie/er} an einem Klassentreffen teilgenommen hat.
- (34)
 - a.
 - (i) Vor vier Monaten hat Timo Sabine einen neuen Haarschnitt verpasst.
 - (ii) Vor vier Monaten hat Sabine Timo einen neuen Haarschnitt verpasst.
 - b.
 - (i) Vor einer Woche hat {Sabine/Timo} wieder einen neuen Haarschnitt bekommen, weil {sie/er} an einem Frisurenwettbewerb teilgenom-

6.1 Material Used in the First Experiment

- men hat.
- (ii) Vor einer Woche hat {Sabine/Timo} wieder einen neuen Haarschnitt kreiert, weil {sie/er} an einem Frisurenwettbewerb teilgenommen hat.
- (35)
- a. (i) Vorletzte Woche hat Timo Tina fünf Euro geborgt.
 - (ii) Vorletzte Woche hat Tina Timo fünf Euro geborgt.
 - b. (i) Vor zwei Tagen hat {Tina/Timo} wieder eine kleine Geldsumme ausgeliehen, als {sie/er} in einer Kneipe verabredet war.
 - (ii) Vor zwei Tagen hat {Tina/Timo} wieder eine kleine Geldsumme verliehen, als {sie/er} in einer Kneipe verabredet war.
- (36)
- a. (i) Vor einem Monat hat Karl Thorsten eine dringende Erinnerung per Mail zukommen lassen.
 - (ii) Vor einem Monat hat Thorsten Karl eine dringende Erinnerung per Mail zukommen lassen.
 - b. (i) Vor zwei Wochen hat {Thorsten/Karl} wieder eine dringende Erinnerung erhalten, während er an einem Projekt gearbeitet hat.
 - (ii) Vor zwei Wochen hat {Thorsten/Karl} wieder eine dringende Erinnerung verschickt, während er an einem Projekt gearbeitet hat.
- (37)
- a. (i) Vor vier Jahren hat Karl Judith ein maßgefertigtes Bett gebaut.
 - (ii) Vor vier Jahren hat Judith Karl ein maßgefertigtes Bett gebaut.
 - b. (i) Vor fünf Wochen hat {Judith/Karl} wieder ein maßgefertigtes Bett bekommen, weil {sie/er} mit einem Freund zusammen zieht.
 - (ii) Vor fünf Wochen hat {Judith/Karl} wieder ein maßgefertigtes Bett konstruiert, weil {sie/er} mit einem Freund zusammen zieht.
- (38)
- a. (i) Vor drei Monaten hat Karl für Linda ein neues Instrument gekauft.
 - (ii) Vor drei Monaten hat Linda für Karl ein neues Instrument gekauft.
 - b. (i) Vor zwei Wochen hat {Linda/Karl} wieder ein neues Instrument bekommen, weil {sie/er} in ein Orchester eingetreten ist.
 - (ii) Vor zwei Wochen hat {Linda/Karl} wieder ein neues Instrument erstanden, weil {sie/er} in ein Orchester eingetreten ist.

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- (39) a. (i) Letztes Jahr hat Karl Timo einen kräftigen Fausthieb verpasst.
(ii) Letztes Jahr hat Timo Karl einen kräftigen Fausthieb verpasst.
- b. (i) Vor vier Wochen hat {Timo/Karl} wieder einen kräftigen Fausthieb ausgeteilt, als er in eine Schlägerei verwickelt war.
(ii) Vor vier Wochen hat {Timo/Karl} wieder einen kräftigen Fausthieb abbekommen, als er in eine Schlägerei verwickelt war.
- (40) a. (i) Vor einem halben Jahr hat Karl Greta charmant zum Tanzen aufgefordert.
(ii) Vor einem halben Jahr hat Greta Karl charmant zum Tanzen aufgefordert.
- b. (i) Vor zwei Wochen hat {Greta/Karl} wieder eine charmante Tanzaufforderung erhalten, als {sie/er} auf einer Party einsam war.
(ii) Vor zwei Wochen hat {Greta/Karl} wieder eine charmante Tanzaufforderung ausgesprochen, als {sie/er} auf einer Party einsam war.

6.2 Material Used in the Second Experiment

wieder

- (1) a. (i) Karl hat noch nie Pinguine gefüttert.
(ii) Karl hat schon oft Pinguine gefüttert.
(iii) Fritz hat noch nie Pinguine gefüttert.
- b. Heute hat Karl wieder keine Pinguine gefüttert und ist traurig.
- (2) a. (i) Susanne hat bereits rote Handschuhe gekauft.
(ii) Susanne hat bisher nie rote Handschuhe gekauft.
(iii) Inge hat bisher nie rote Handschuhe gekauft.
- b. Heute hat Susanne wieder rote Handschuhe gekauft und sie gleich angezogen.
- (3) a. (i) Fritz hat niemals an einem Marathon teilgenommen.
(ii) Fritz hat einmal an einem Marathon teilgenommen.
(iii) Karl hat niemals an einem Marathon teilgenommen.

6.2 Material Used in the Second Experiment

- b. Dieses Jahr hat Fritz wieder nicht einem Marathon teilgenommen und ist enttäuscht.
- (4)
- a. (i) Inge ist bis dato eine Auszeichnung als beste Mitarbeiterin immer entgangen.
(ii) Inge ist oft eine Auszeichnung als beste Mitarbeiterin verliehen worden.
(iii) Susanne ist oft eine Auszeichnung als beste Mitarbeiterin verliehen worden.
 - b. Letzten Montag ist Inge wieder keine Auszeichnung als beste Mitarbeiterin verliehen worden und das stört sie.
- (5)
- a. (i) Karl hat jedes Angebot für eine Lebensversicherung abgelehnt.
(ii) Karl hat vor zehn Jahren ein Angebot für eine Lebensversicherung angenommen.
(iii) Fritz hat jedes Angebot für eine Lebensversicherung abgelehnt.
 - b. Gestern hat Karl wieder ein Angebot für eine Lebensversicherung abgelehnt, das ihm unterbreitet worden ist.
- (6)
- a. (i) Tina hat letztes Jahr Fritz Charme nachgegeben.
(ii) Tina hat Fritz Charme immer widerstanden.
(iii) Inge hat Fritz Charme immer widerstanden.
 - b. Letzte Woche hat Tina wieder Fritz Charme nachgegeben und erzählt es Susanne.
- (7)
- a. (i) Fritz hat vor zwei Jahren Susannes Geburtstag vergessen.
(ii) Fritz hat stets an Susannes Geburtstag gedacht.
(iii) Karl hat vor zwei Jahren Susannes Geburtstag vergessen.
 - b. Dieses Jahr hat Fritz wieder Susannes Geburtstag vergessen und er bittet um Entschuldigung.
- (8)
- a. (i) Fritz hat sich letztes Jahr einen Hund gekauft.
(ii) Fritz hat sich in seinem ganzen Leben noch keinen Hund gekauft.
(iii) Susanne hat sich in ihrem ganzen Leben noch keinen Hund gekauft.
 - b. Gestern hat Fritz sich wieder einen Hund gekauft und nennt ihn Rex.

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- (9) a. (i) Inge hat des fteren eine Rede vor mehr als hundert Menschen gehalten.
(ii) Inge hat bisher nur Reden vor weniger als hundert Menschen gehalten.
(iii) Fritz hat des fteren eine Rede vor mehr als hundert Menschen gehalten.
- b. Letzten Samstag hat Inge wieder eine Rede vor mehr als hundert Menschen gehalten und hat viel Applaus bekommen.
- (10) a. (i) Karl hat in seinem Leben viele Blind Dates gehabt.
(ii) Karl hat bis zum heutigen Tag Blind Dates gemieden.
(iii) Inge hat bis zum heutigen Tag Blind Dates gemieden.
- b. Heute hat Karl wieder ein Blind Date gehabt und es war enttäuschend.
- (11) a. (i) Karl hat bis jetzt auf Reisen ins Ausland verzichtet.
(ii) Karl ist letztes Jahr ins Ausland gereist.
(iii) Tina hat bis jetzt auf Reisen ins Ausland verzichtet.
- b. Dieses Jahr ist Karl wieder nicht ins Ausland gereist und ist an die Ostsee gefahren.
- (12) a. (i) Karl hat häufiger eine Kostümparty veranstaltet.
(ii) Karl hat in der Vergangenheit nie eine Kostümparty veranstaltet.
(iii) Tina hat in der Vergangenheit nie eine Kostümparty veranstaltet.
- b. Letzte Woche hat Karl wieder eine Kostümparty veranstaltet und ist als Käfer gegangen.

wissen

- (1) a. (i) Tina ist nicht in Fritz verliebt.
(ii) Tina ist in Fritz verliebt.
(iii) Inge ist nicht in Fritz verliebt.
- b. Er weiß, dass Tina nicht in ihn verliebt ist und betrinkt sich.
- (2) a. (i) Susanne hat keine Katze.
(ii) Susanne hat eine Katze.
(iii) Susanne hat einen Hund.
- b. Inge weiß, dass Susanne keine Katze hat und findet das gut.

6.2 Material Used in the Second Experiment

- (3) a. (i) Inge hat keinen Bruder.
(ii) Inge hat einen Bruder.
(iii) Inge hat keine Schwester.
b. Karl weiß, dass sie keinen Bruder hat und erzählt das Susanne.
- (4) a. (i) Susanne ist schwanger.
(ii) Susanne ist nicht schwanger.
(iii) Inge ist nicht schwanger.
b. Tina weiß, dass Susanne schwanger ist und ist überrascht.
- (5) a. (i) Fritz kann nicht mit den Ohren wackeln.
(ii) Fritz kann mit den Ohren wackeln.
(iii) Susanne kann nicht mit den Ohren wackeln.
b. Karl weiß, dass Fritz nicht mit den Ohren wackeln kann und findet das erstaunlich.
- (6) a. (i) Inge hat eine Tätowierung.
(ii) Inge hat keine Tätowierung.
(iii) Karl hat keine Tätowierung.
b. Fritz weiß, dass Inge eine Tätowierung hat und findet sowas schön.
- (7) a. (i) Inges Mutter hat einen Liebhaber.
(ii) Inges Mutter hat keinen Liebhaber.
(iii) Susanne hat einen Liebhaber.
b. Inge weiß, dass ihre Mutter einen Liebhaber hat und behält das für sich.
- (8) a. (i) Fritz kann nicht gut tanzen.
(ii) Fritz kann gut tanzen.
(iii) Susanne kann gut tanzen.
b. Karl weiß, dass Fritz nicht gut tanzen kann und will es ihm beibringen.
- (9) a. (i) Susanne hat eine Stiefmutter.
(ii) Susanne hat keine Stiefmutter.
(iii) Karl hat eine Stiefmutter.
b. Tina weiß, dass Susanne eine Stiefmutter hat und erzählt es Fritz.

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- (10) a. (i) Fritz hat kein Auto.
(ii) Fritz hat ein Auto.
(iii) Tina hat ein Auto.
b. Susanne weiß, dass Fritz kein Auto hat und fährt ihn oft zur Arbeit.
- (11) a. (i) Inge hat Depressionen.
(ii) Inge hat keine Depressionen.
(iii) Susanne hat Depressionen.
b. Fritz weiß, dass Inge Depressionen hat und empfiehlt ihr einen Arzt.
- (12) a. (i) Karl ist geschieden.
(ii) Karl ist nicht geschieden.
(iii) Inge ist nicht geschieden.
b. Fritz weiß, dass Karl geschieden ist und stellt ihm eine Kollegin vor.

sein/e

- (1) a. (i) Ein Kollege von Tina hat mehrere Bücher geschrieben.
(ii) Ein Kollege von Tina hat ein Buch geschrieben.
(iii) Ein Kollege von Tina hat mehrere Artikel geschrieben.
b. Sie kauft sich seine Bücher und liest sie.
- (2) a. (i) Inges Vater hat eine Distel.
(ii) Inges Vater hat keine Distel.
(iii) Inges Vater hat einen Dackel.
b. Sie sticht sich an seiner Distel und flucht.
- (3) a. (i) Fritz besitzt ein Restaurant.
(ii) Fritz besitzt mehrere Restaurants.
(iii) Fritz besitzt einen Friseursalon.
b. Susanne geht in sein Restaurant und trifft Bekannte.
- (4) a. (i) Fritz hat mehre Ferrari.
(ii) Fritz hat einen Ferrari.
(iii) Fritz hat einen Volvo.
b. Tina sieht seine Ferrari und bewundert sie.

6.2 Material Used in the Second Experiment

- (5) a. (i) Inges Vater besitzt eine Gärtnerei.
(ii) Inges Vater besitzt mehrere Gärtnereien.
(iii) Inges Vater besitzt einen Bauernhof.
b. Sie besucht ihn in seiner Gärtnerei und geht mit ihm Mittagessen.
- (6) a. (i) Karl hat viele Katzen.
(ii) Karl hat eine Katze.
(iii) Karl hat einen Pudel.
b. Susanne streichelt seine Katzen und findet sie süß.
- (7) a. (i) Tinas Bruder besitzt ein Taxi.
(ii) Tinas Bruder besitzt mehrere Taxen.
(iii) Tinas Bruder besitzt ein Fahrrad.
b. Sie leiht sich sein Taxi und fährt nach Potsdam.
- (8) a. (i) Fritz hat zwei Hunde.
(ii) Fritz hat einen Hund.
(iii) Fritz hat einen Wellensittich.
b. Inge wäscht seine Hunde und füttert sie.
- (9) a. (i) Fritz hat zwei Fernseher.
(ii) Fritz hat keinen Fernseher.
(iii) Fritz hat zwei Radios.
b. Susanne repariert seine Fernseher und Fritz ist ihr dankbar.
- (10) a. (i) Karl hat einige Orchidee.
(ii) Karl hat keine Orchideen.
(iii) Karl hat keine Rosen.
b. Tina gießt seine Orchideen und düngt sie.
- (11) a. (i) Karl hat einen Laptop.
(ii) Karl hat keinen Laptop.
(iii) Karl hat ein Mobiltelefon.
b. Inge leiht seinen Laptop aus und bedankt sie mit einem Essen.
- (12) a. (i) Karl trägt eine Brille.

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- (ii) Karl trägt keine Brille.
- (iii) Karl trägt keine Kiste.
- b. Susanne bewundert seine Brille und macht ihm ein Kompliment.

auch

- (1) a. (i) Tina hat kein Geschenk für Karl mitgebracht.
(ii) Alle haben ein Geschenk für Karl mitgebracht.
(iii) Tina hat keinen Salat für Karl mitgebracht.
- b. Er vermutet, dass auch Fritz kein Geschenk für ihn mitgebracht hat und ist deswegen missmutig.
- (2) a. (i) Fritz kocht heute eine Suppe mit Tina.
(ii) Niemand kocht heute eine Suppe mit Tina.
(iii) Niemand isst heute eine Suppe mit Tina.
- b. Sie hofft, dass auch Susanne heute eine Suppe mit ihr kocht und kauft dafür Zutaten.
- (3) a. (i) Karl schuldet Susanne noch Geld.
(ii) Niemand schuldet Susanne noch Geld.
(iii) Karl schuldet Susanne noch einen Gefallen.
- b. Sie glaubt, dass auch Inge ihr noch Geld schuldet und ruft sie an.
- (4) a. (i) Fritz schreibt einen Song für Inge.
(ii) Niemand schreibt einen Song für Inge.
(iii) Niemand schreibt ein Gedicht für Inge.
- b. Sie hofft, dass auch Karl einen Song für sie schreibt und ist gespannt.
- (5) a. (i) Heute machen alle machen Tina ein Kompliment.
(ii) Heute macht niemand Tina ein Kompliment.
(iii) Heute macht Fritz Tina einen Heiratsantrag.
- b. Sie nimmt an, dass auch Karl ihr heute ein Kompliment macht und wartet ungeduldig.
- (6) a. (i) Fritz schenkt Susanne nichts Selbstgebasteltes zu Weihnachten.
(ii) Alle schenken Susanne etwas Selbstgebasteltes zu Weihnachten.

6.2 Material Used in the Second Experiment

- (iii) Alle schenken Susanne etwas Großes zu Weihnachten.
 - b. Sie fürchtet, dass auch Tina ihr nichts Selbstgebasteltes zu Weihnachten schenkt und ist betrübt.
- (7)
- a.
 - (i) Inge kocht am Wochenende für Fritz.
 - (ii) Niemand kocht am Wochenende für Fritz.
 - (iii) Inge singt am Wochenende für Fritz.
 - b. Er wünscht sich, dass auch Tina am Wochenende für ihn kocht und sagt ihr das.
- (8)
- a.
 - (i) Niemand sammelt Pilze für Karl.
 - (ii) Susanne sammelt Pilze für Karl.
 - (iii) Susanne sammelt Briefmarken für Karl.
 - b. Er vermutet, dass auch Tina keine Pilze für ihn sammelt und geht selbst welche suchen.
- (9)
- a.
 - (i) Karl findet Inge unsympathisch.
 - (ii) Alle finden Inge sympathisch.
 - (iii) Karl findet Inge gutaussehend.
 - b. Tina denkt, dass auch Fritz Inge unsympathisch findet und kann das nicht verstehen.
- (10)
- a.
 - (i) Karl findet Susannes neue Frisur schrecklich.
 - (ii) Alle finden Susannes neue Frisur gut.
 - (iii) Alle finden Susannes neue Tasche gut.
 - b. Sie befürchtet, dass auch Fritz ihre neue Frisur schrecklich findet und versteckt sich.
- (11)
- a.
 - (i) Alle haben heute eine schlechte Nachricht für Fritz.
 - (ii) Niemand hat heute eine schlechte Nachricht für Fritz.
 - (iii) Alle haben heute eine interessante Nachricht für Fritz.
 - b. Er ahnt, dass auch Susanne heute eine schlechte Nachricht für ihn hat und meidet sie.
- (12)
- a.
 - (i) Fritz kauft eine Kaffeemaschine für Karl.
 - (ii) Niemand kauft eine Kaffeemaschine für Karl.

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- (iii) Niemand kauft einen Wasserkocher für Karl.
- b. Karl geht davon aus, dass auch Tina eine Kaffeemaschine für ihn kauft und will sie davon abhalten.

aufhören

- (1) a. (i) Karl hilft in einem Altersheim aus.
(ii) Karl hilft nicht in einem Altersheim aus.
(iii) Susanne hilft in einem Altersheim aus.
b. Karl wird aufhören im Altersheim auszuhelfen und teilt dies einem Vorgesetzten mit.
- (2) a. (i) Fritz geht abends oft joggen
(ii) Fritz geht abends nie joggen.
(iii) Susanne geht abends nie joggen.
b. Fritz wird aufhören abends joggen zu gehen und meldet sich zum Yoga an.
- (3) a. (i) Susanne und Fritz gehen oft gemeinsam Tanzen.
(ii) Susanne und Fritz gehen nie gemeinsam Tanzen.
(iii) Tina und Karl gehen oft gemeinsam Tanzen.
b. Susanne und Fritz werden aufhören gemeinsam Tanzen zu gehen, weil Fritz Knieprobleme hat.
- (4) a. (i) Fritz sammelt Briefmarken.
(ii) Fritz sammelt keine Briefmarken.
(iii) Tina sammelt keine Briefmarken.
b. Fritz wird aufhören Briefmarken zu sammeln, weil es zu teuer ist.
- (5) a. (i) Fritz hat einen alten Corsa, den er nie abschließt.
(ii) Fritz hat einen alten Corsa, den er immer abschließt.
(iii) Susanne hat einen alten Corsa, den sie nie abschließt.
b. Fritz wird aufhören seinen Corsa offen stehen zu lassen, weil er Angst vor Dieben hat.
- (6) a. (i) Karl ist Raucher.
(ii) Karl ist Nichtraucher.

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- (iii) Fritz ist Nichtraucher.
 - b. Karl wird aufhören zu rauchen, weil es ungesund ist.
- (7)
- a.
 - (i) Fritz isst kein Fleisch.
 - (ii) Fritz isst täglich Fleisch.
 - (iii) Tina isst kein Fleisch.
 - b. Jetzt wird Fritz aufhören Vegetarier zu sein, weil er Eisenmangel hat.
- (8)
- a.
 - (i) Fritz geht nie auf Parties.
 - (ii) Fritz geht oft auf Parties.
 - (iii) Karl geht oft auf Parties.
 - b. Fritz wird von nun an aufhören Einladungen zu Parties auszuschlagen weil er manchmal einsam ist.
- (9)
- a.
 - (i) Inge macht zurzeit eine Diät.
 - (ii) Inge macht zurzeit keine Diät.
 - (iii) Susanne macht zurzeit eine Diät.
 - b. Inge wird aufhören eine Diät zu machen, weil sie Süßes zu sehr vermisst.
- (10)
- a.
 - (i) Fritz macht nie Sport.
 - (ii) Fritz macht täglich Sport.
 - (iii) Karl macht täglich Sport.
 - b. Fritz wird aufhören ohne Sport zu leben, weil er gesundheitliche Probleme hat.
- (11)
- a.
 - (i) Karl isst nie gesunde Sachen.
 - (ii) Karl isst nur gesunde Sachen.
 - (iii) Inge isst nie gesunde Sachen.
 - b. Karl wird ab jetzt aufhören sich ungesund zu ernähren, weil er einen Bericht über Vitaminmangel gelesen hat.
- (12)
- a.
 - (i) Karl spendet nie Geld für soziale Zwecke.
 - (ii) Karl spendet immer Geld für soziale Zwecke.
 - (iii) Inge spendet oft Geld für soziale Zwecke.
 - b. Karl wird aufhören Spendenaufrufe zu ignorieren, weil er ein schlechtes Gewissen hat.

6.3 Material Used in the Third Experiment

ihr,e/sein,e

- (1) a. (i) Sabine, Inge und Karin nehmen an einer Konferenz teil. Sabine und Inge haben neulich einen Laptop von ihrem Arbeitgeber bekommen, während Karin erst einen Laptop kaufen muss.
(ii) Sabine, Inge und Karin nehmen an einer Konferenz teil. Sabine und Inge haben neulich einen Laptop von ihrem Arbeitgeber bekommen, während Karin selbst einen Laptop kaufen musste.
- b. (i) Heute hat jede der drei Konferenzteilnehmerinnen {ihren/einen} Laptop in einer Sitzung benutzt.
(ii) Heute hat eine der drei Konferenzteilnehmerinnen {ihren/einen} Laptop in einer Sitzung benutzt.
- (2) a. (i) Steffen, Jörg und Sebastian singen gemeinsam in einem Chor. Jörg und Steffen haben schon lange eine eigene Chormappe, während Sebastian erst eine Chormappe bestellen muss.
(ii) Steffen, Jörg und Sebastian singen gemeinsam in einem Chor. Jörg und Steffen haben schon lange eine eigene Chormappe, während Sebastian erst seit Kurzem eine Chormappe hat.
- b. (i) Vorgestern hat jeder der drei Sänger {seine/eine} Chormappe für das nächste Konzert geordnet.
(ii) Vorgestern hat einer der drei Sänger {seine/eine} Chormappe für das nächste Konzert geordnet.
- (3) a. (i) Bernd, Hans und Dominik arbeiten zusammen auf einer Baustelle. Dominik und Hans haben eine blaue Vesperdose, während Bernd keine Vesperdose hat.
(ii) Bernd, Hans und Dominik arbeiten zusammen auf einer Baustelle. Dominik und Hans haben eine blaue Vesperdose, während Bernd eine rote Vesperdose hat.
- b. (i) Heute hat jeder der drei Bauarbeiter {seine/eine} Vesperdose im Bauschutt entdeckt.

6.3 Material Used in the Third Experiment

- (ii) Heute hat einer der drei Bauarbeiter {seine/eine} Vesperdose im Bauschutt entdeckt.
- (4)
 - a.
 - (i) Klara, Nadine und Steffi studieren gemeinsam Geschichte. Nadine und Klara haben einen modernen Fahrradhelm, während Steffi einen Fahrradhelm überflüssig findet.
 - (ii) Klara, Nadine und Steffi studieren gemeinsam Geschichte. Nadine und Klara haben einen modernen Fahrradhelm, während Steffi einen älteren Fahrradhelm besitzt.
 - b.
 - (i) Gestern hat jede der drei Studentinnen {ihren/einen} Fahrradhelm bei einer Fahrradübung getragen.
 - (ii) Gestern hat eine der drei Studentinnen {ihren/einen} Fahrradhelm bei einer Fahrradübung getragen.
- (5)
 - a.
 - (i) Simon, Tobias und Basti sind Büroangestellte. Simon und Tobias haben beide ein sportliches Auto, während Basti ohne Auto klar kommt.
 - (ii) Simon, Tobias und Basti arbeiten zusammen in einer Firma. Simon und Tobias haben beide ein sportliches Auto, während Basti ein elegantes Auto hat.
 - b.
 - (i) Am Wochenende hat jeder der drei Angestellten {sein/ein} Auto ausgesprochen bewundert.
 - (ii) Am Wochenende hat einer der drei Angestellten {sein/ein} Auto ausgesprochen bewundert.
- (6)
 - a.
 - (i) Rosi, Hanna und Iris sind auf dem Elternabend ihrer Kinder. Iris und Rosi besitzen eine Handtasche aus Leder, während Hanna keine Handtasche hat.
 - (ii) Rosi, Hanna und Iris sind auf dem Elternabend ihrer Kinder. Iris und Rosi besitzen eine Handtasche aus Leder, während Hanna eine Handtasche aus Stoff besitzt.
 - b.
 - (i) Heute hat jede der drei Mütter {ihre/eine} Handtasche beim Elternabend umgeschmissen.

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- (ii) Heute hat eine der drei Mütter {ihre/eine} Handtasche beim Elternabend umgeschmissen.
- (7) a. (i) Peter, Johannes und Martin spielen zusammen in einer Band. Peter und Johannes haben ein Handy von Nokia, während Martin kein Handy besitzt.
(ii) Peter, Johannes und Martin spielen zusammen in einer Band. Peter und Johannes haben ein Handy von Nokia, während Martin ein Samsung Handy hat.
- b. (i) Gestern hat jedes der drei Bandmitglieder {sein/ein} Handy in der Bandprobe benutzt.
(ii) Gestern hat eines der drei Bandmitglieder {sein/ein} Handy in der Bandprobe benutzt.
- (8) a. (i) Sarah, Babette und Monika arbeiten gemeinsam in einer Arztpraxis. Sarah und Babette haben einen Dackel, während Monika zwei Katzen hat.
(ii) Sarah, Babette und Monika arbeiten gemeinsam in einer Arztpraxis. Sarah und Babette haben einen Dackel, während Monika einen Schäferhund besitzt.
- b. (i) Letzte Woche hat jede der drei Arzthelferinnen {ihren/einen} Hund in der Praxis gestreichelt.
(ii) Letzte Woche hat eine der drei Arzthelferinnen {ihren/einen} Hund in der Praxis gestreichelt.
- (9) a. (i) Bert, Stefan und Andreas sind zusammen in einer Partei. Bert und Stefan haben einen grauen Anzug, während Andreas keine Anzüge besitzt.
(ii) Bert, Stefan und Andreas sind zusammen in einer Partei. Bert und Stefan haben einen grauen Anzug, während Andreas einen schwarzen Anzug besitzt.
- b. (i) Heute hat jeder der drei Politiker {seinen/einen} Anzug in der Parteisitzung an.

6.3 Material Used in the Third Experiment

- (ii) Heute hat einer der drei Politiker {seinen/einen} Anzug in der Parteisitzung an.
- (10)
- a. (i) Britta, Anna und Klara sammeln oft gemeinsam Spenden für einen guten Zweck. Britta und Anna besitzen eine neue Sammeldose, während Klara keine eigene Dose hat.
 - (ii) Britta, Anna und Klara sammeln oft gemeinsam Spenden für einen guten Zweck. Britta und Anna besitzen eine neue Sammeldose, während Klara eine alte Dose hat.
 - b. (i) Letztes Wochenende hatte jede der drei Spendensammlerinnen {ihre/eine} Dose zum Sammeln dabei.
 - (ii) Letztes Wochenende hatte eine der drei Spendensammlerinnen {ihre/eine} Dose zum Sammeln dabei.
- (11)
- a. (i) Arthur, Josef und Kilian gehen oft gemeinsam wandern. Arthur und Josef besitzen einen Wanderstock aus Holz, während Kilian immer einen Wanderstock ausleiht.
 - (ii) Arthur, Josef und Kilian gehen oft gemeinsam wandern. Arthur und Josef besitzen einen Wanderstock aus Holz, während Kilian einen Wanderstock aus Plastik hat.
 - b. (i) Vor zwei Tagen hatte jeder der drei Wanderer {seinen/einen} Wanderstock für die Wanderung dabei.
 - (ii) Vor zwei Tagen hatte einer der drei Wanderer {seinen/einen} Wanderstock für die Wanderung dabei.
- (12)
- a. (i) Nathalie, Svenja und Elisabeth sind zusammen in einem Yogakurs. Nathalie und Svenja besitzen eine Yogamatte aus Kunststoff, während Elisabeth noch keine eigene Matte hat.
 - (ii) Nathalie, Svenja und Elisabeth sind zusammen in einem Yogakurs. Nathalie und Svenja besitzen bereits Yogamatte aus Kunststoff, während Elisabeth eine Yogamatte aus Stoff hat.
 - b. (i) Gestern hat jede der drei Yogaschülerinnen {ihre/eine} Yogamatte im Unterricht benutzt.

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- (ii) Gestern hat eine der drei Yogaschülerinnen {ihre/eine} Yogamatte im Unterricht benutzt.
- (13)
 - a.
 - (i) Dietmar, Sam und Valentin sind in einem Laufverein. Dietmar und Sam haben einen Pulsmesser mit Stoppuhr, während Valentin keinen Pulsmesser besitzt.
 - (ii) Dietmar, Sam und Valentin sind in einem Laufverein. Dietmar und Sam haben einen Pulsmesser mit Stoppuhr, während Valentin einen Pulsmesser ohne Stoppuhr besitzt.
 - b.
 - (i) Letzte Woche hat jeder der drei Läufer {seinen/einen} Pulsmesser im Training verwendet.
 - (ii) Letzte Woche hat einer der drei Läufer {seinen/einen} Pulsmesser im Training verwendet.
- (14)
 - a.
 - (i) Ulrike, Laura und Kerstin sind gemeinsam in einer Tanzgruppe. Ulrike und Laura haben seit vielen Jahren einen Freund, während Kerstin zurzeit solo ist.
 - (ii) Ulrike, Laura und Kerstin sind gemeinsam in einer Tanzgruppe. Ulrike und Laura haben seit vielen Jahren einen Freund, während Kerstin erst seit Kurzem einen Freund hat.
 - b.
 - (i) Vorgestern hatte jede der drei Tänzerinnen {ihren/einen} Freund bei der Probe dabei.
 - (ii) Vorgestern hatte eine der drei Tänzerinnen {ihren/einen} Freund bei der Probe dabei.
- (15)
 - a.
 - (i) Hubert, Florian und Rudi sind Wärter im Frankfurter Zoo. Hubert und Florian einen blauen Rucksack, während Rudi nur eine Trage tasche besitzt.
 - (ii) Hubert, Florian und Rudi sind Wärter im Frankfurter Zoo. Hubert und Florian einen blauen Rucksack, während Rudi einen gelben Rucksack besitzt.
 - b.
 - (i) Letzten Montag hatte jeder der drei Zoowärter {seinen/einen} Rucksack im Aufenthaltsraum deponiert.

6.3 Material Used in the Third Experiment

- (ii) Letzten Montag hatte einer der drei Zoowärter {seinen/einen} Rucksack im Aufenthaltsraum deponiert.
- (16)
- a. (i) Nadja, Antje und Marianne leiten eine Ballettschule. Nadja und Antje haben beide eine 5 jährige Tochter, während Marianne einen 13 jährigen Sohn hat.
 - (ii) Nadja, Antje und Marianne leiten eine Ballettschule. Nadja und Antje haben beide eine 5 jährige Tochter, während Marianne eine 13 jährige Tochter hat.
 - b. (i) Letzte Woche hat jede der drei Ballettlehrerinnen {ihrem/einem} Mädchen eine Ballettübung beigebracht.
 - (ii) Letzte Woche hat eine der drei Ballettlehrerinnen {ihrem/einem} Mädchen eine Ballettübung beigebracht.
- (17)
- a. (i) Jürgen, Harald und Peter sind seit kurzem in Rente. Jürgen hat ein Mountainbike, während Harald und Peter kein Fahrrad haben.
 - (ii) Jürgen, Harald und Peter sind seit kurzem in Rente. Jürgen hat ein Mountainbike, während Harald und Peter ein Rennrad haben.
 - b. (i) Gestern war jeder der drei Rentner mit {seinem/einem} Fahrrad in einen Unfall verwickelt.
 - (ii) Gestern war eine der drei Rentner mit {seinem/einem} Fahrrad in einen Unfall verwickelt.
- (18)
- a. (i) Kathrin, Claudia und Frauke gehen gelegentlich gemeinsam Klettern. Kathrin hat ein rotes Kletterseil, während Claudia und Frauke noch kein eigenes Kletterseil besitzen.
 - (ii) Kathrin, Claudia und Frauke gehen gelegentlich gemeinsam Klettern. Kathrin hat ein rotes Kletterseil, während Claudia und Frauke ein blaues Kletterseil besitzen.
 - b. (i) Heute hat jede der drei Kletterinnen {ihr/ein} Kletterseil in bei einem Kletterkurs benutzt.
 - (ii) Heute hat eine der drei Kletterinnen {ihr/ein} Kletterseil in bei einem Kletterkurs benutzt.

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- (19) a. (i) Hans, Peter und Bernd spielen zusammen Fußball. Hans besitzt einen neuen Fußball, während Peter und Bernd keinen eigenen Fußball haben.
- (ii) Hans, Peter und Bernd spielen zusammen Fußball. Hans besitzt einen neuen Fußball, während Peter und Bernd einen etwas älteren Fußball haben.
- b. (i) Letzten Dienstag hat jeder der drei Fußballspieler {seinen/einen} Fußball gegen den Kopf bekommen.
- (ii) Letzten Dienstag hat einer der drei Fußballspieler {seinen/einen} Fußball gegen den Kopf bekommen.
- (20) a. (i) Nicole, Martina und Laura spielen zusammen Schach. Nicole hat eine Schachuhr aus Holz, während Martina und Laura bisher ohne Schachuhr ausgekommen sind.
- (ii) Nicole, Martina und Laura spielen zusammen Schach. Nicole hat eine Schachuhr aus Holz, während Martina und Laura eine Schachuhr aus Plastik haben.
- b. (i) Letzten Samstag hat jede der drei Schachspielerinnen {ihre/eine} Schachuhr falsch eingestellt.
- (ii) Letzten Samstag hat eine der drei Schachspielerinnen {ihre/eine} Schachuhr falsch eingestellt.
- (21) a. (i) Armin, Jonathan und Elias gehen gerne auf Partys. Armin hat eine Digitalkamera von Nikon, während Jonathan und Elias keine Digitalkamera besitzen.
- (ii) Armin, Jonathan und Elias gehen gerne auf Partys. Armin hat eine Digitalkamera von Nikon, während Jonathan und Elias eine Digitalkamera von Sony besitzen.
- b. (i) Am Wochenende hat jeder der drei Partygänger {seine/eine} Kamera benutzt um Fotos zu machen.
- (ii) Am Wochenende hat einer der drei Partygänger {seine/eine} Kamera benutzt um Fotos zu machen.
- (22) a. (i) Gundula, Eva und Martha backen gerne. Gundula hat ein Rezept mit

6.3 Material Used in the Third Experiment

- Schokolade erfunden, während Eva und Martha kein Rezept erfunden haben.
- (ii) Gundula, Eva und Martha backen gerne. Gundula hat ein Rezept mit Schokolade erfunden, während Eva und Martha jeweils ein Rezept mit Vanille erfunden haben.
- b. (i) Gestern hat jede der drei Bäckerinnen {ihr/ein} Rezept bei einem Wettbewerb gebacken.
 - (ii) Gestern hat eine der drei Bäckerinnen {ihr/ein} Rezept bei einem Wettbewerb gebacken.
- (23) a. (i) Markus, Philip und Matthias haben gemeinsam Motorradfahren gelernt. Markus hat ein Motorrad geschenkt bekommen, während Philip und Matthias kein Motorrad besitzen.
- (ii) Markus, Philip und Matthias haben gemeinsam Motorradfahren gelernt. Markus hat ein Motorrad geschenkt bekommen, während Philip und Matthias jeweils ein Motorrad gekauft haben.
- b. (i) Vorgestern hat jeder der drei Motorradfahrer {sein/ein} Motorrad auf Hochglanz poliert.
 - (ii) Vorgestern hat einer der drei Motorradfahrer {sein/ein} Motorrad auf Hochglanz poliert.
- (24) a. (i) Susanne, Aline und Lisa arbeiten im selben Büro. Susanne hat einen Golden Retriever, während Aline und Lisa keinen Hund haben.
- (ii) Susanne, Aline und Lisa arbeiten im selben Büro. Susanne hat einen Golden Retriever, während Aline und Lisa einen Labrador haben.
- b. (i) Heute morgen hat jede der drei Kolleginnen {ihren/einen} Hund auf die Straße laufen sehen.
 - (ii) Heute morgen hat eine der drei Kolleginnen {ihren/einen} Hund auf die Straße laufen sehen.
- (25) a. (i) Marian, Nathan und Robert spielen Geige. Marian hat sich für einen Auftritt eine neue Fliege gekauft, während Nathan und Robert beide keine Fliege haben.

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- (ii) Marian, Nathan und Robert singen gemeinsam in einem Chor. Marian hat sich für einen Auftritt eine neue Fliege gekauft, während Nathan und Robert beide eine Fliege geschenkt bekommen haben.
 - b.
 - (i) Am Wochenende hat jeder der drei Geigenspieler {seine/eine} Fliege bei einem Freund vergessen.
 - (ii) Am Wochenende hat einer der drei Geigenspieler {seine/eine} Fliege bei einem Freund vergessen.
- (26)
- a.
 - (i) Erika, Teresa und Annika gehen gerne gemeinsam Joggen. Während Erika eine Stirnlampe von ihren Eltern bekommen hat, haben Teresa und Annika keine Stirnlampe.
 - (ii) Erika, Teresa und Annika gehen gerne gemeinsam Joggen. Während Erika eine Stirnlampe von ihren Eltern bekommen hat, mussten sich Teresa und Annika erst eine Stirnlampe kaufen.
 - b.
 - (i) Letzten Dienstag hat jede der drei Läuferinnen {ihre/eine} Stirnlampe am Abend getragen.
 - (ii) Letzten Dienstag hat eine der drei Läuferinnen {ihre/eine} Stirnlampe am Abend getragen.
- (27)
- a.
 - (i) Max, Arnold und Kai kennen sich schon aus der Grundschule. Während Max einen Tischtennisschläger von seinem Trainer bekommen hat, haben Arnold und Kai keinen Tischtennisschläger bekommen.
 - (ii) Max, Arnold und Kai kennen sich schon aus der Grundschule. Während Max einen Tischtennisschläger von seinem Trainer bekommen hat, haben Arnold und Kai einen Tischtennisschläger von ihren Vätern bekommen.
 - b.
 - (i) Vor zwei Tagen hat jeder der drei Freunde {seinen/einen} Tischtennisschläger in einem Match ausprobiert.
 - (ii) Vor zwei Tagen hat einer der drei Freunde {seinen/einen} Tischtennisschläger in einem Match ausprobiert.
- (28)
- a.
 - (i) Cosima, Dina und Tanja ziehen zusammen in eine WG. Während Cosima eine Zimmerpflanze bei Ikea gekauft hat, haben sich Dina und Tanja keine Zimmerpflanze gekauft.

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- (ii) Cosima, Dina und Tanja ziehen zusammen in eine WG. Während Cosima eine Zimmerpflanze bei Ikea gekauft hat, haben sich Dina und Tanja eine Zimmerpflanze bei OBI gekauft.
- b. (i) Gestern hat jede der drei Freundinnen {ihre/eine} Zimmerpflanze von Läusen befreit.
- (ii) Gestern hat eine der drei Freundinnen {ihre/eine} Zimmerpflanze von Läusen befreit.

again

- (1) a. (i) Marie, Sophie und Anna spielen an einem Theater. Sophie und Anna waren letzte Woche Schlittschuhlaufen, während Marie noch nie Schlittschuhlaufen war.
- (ii) Marie, Sophie und Anna spielen an einem Theater. Sophie und Anna waren letzte Woche Schlittschuhlaufen, während Marie vor zwei Wochen Schlittschuhlaufen war.
- b. (i) Gestern war jede der drei Schauspielerinnen {wieder/mittags} Schlittschuhlaufen, weil das Wetter so schön war.
- (ii) Gestern war eine der drei Schauspielerinnen {wieder/mittags} Schlittschuhlaufen, weil das Wetter so schön war.
- (2) a. (i) Max, Leon und Paul sind Elektriker. Max und Leon waren vorgestern Skifahren, während Paul noch nie Skifahren war.
- (ii) Max, Leon und Paul sind Elektriker. Max und Leon waren vorgestern Skifahren, während Paul noch nie Skifahren war.
- b. (i) Gestern war jeder der drei Elektriker {wieder/tagsüber} Skifahren, weil es schönen Neuschnee gab.
- (ii) Gestern war einer der drei Elektriker {wieder/tagsüber} Skifahren, weil es schönen Neuschnee gab.
- (3) a. (i) Leonie, Lena und Charlotte unterrichten an einem Abendgymnasium. Leonie und Lena waren vor zwei Wochen zum ersten Mal Drachenfliegen, während Charlotte noch nie Drachenfliegen war.
- (ii) Leonie, Lena und Charlotte unterrichten an einem Abendgymnasium.

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- Leonie und Lena waren vor zwei Wochen zum ersten Mal Drachenfliegen, während Charlotte schon oft Drachenfliegen war.
- b. (i) Letzten Dienstag war jede der drei Lehrerinnen {wieder/im Gebirge} Drachenfliegen, weil es guten Aufwind gab.
- (ii) Letzten Dienstag war eine der drei Lehrerinnen {wieder/im Gebirge} Drachenfliegen, weil es guten Aufwind gab.
- (4) a. (i) Lukas, Felix und Elias haben gemeinsam einen Skatclub. Lukas und Felix waren letzten Donnerstag Pilze sammeln, während Elias noch nie Pilze gesammelt hat.
- (ii) Lukas, Felix und Elias haben gemeinsam einen Skatclub. Lukas und Felix waren letzten Donnerstag Pilze sammeln, während Elias noch nie Pilze gesammelt hat.
- b. (i) Gestern war jeder der drei Skatspieler {wieder/im Wald} Pilze sammeln, weil gerade Pilzsaison ist.
- (ii) Gestern war einer der drei Skatspieler {wieder/im Wald} Pilze sammeln, weil gerade Pilzsaison ist.
- (5) a. (i) Emma, Sanne und Lotte arbeiten für eine Übersetzungsfirma. Emma und Sanne waren vor vier Monaten Bergsteigen, während Lotte noch nie Bergsteigen war.
- (ii) Emma, Sanne und Lotte arbeiten für eine Übersetzungsfirma. Emma und Sanne waren vor vier Monaten Bergsteigen, während Lotte vor vier Wochen Bergsteigen war.
- b. (i) Vor zwei Wochen war jede der drei Übersetzerinnen {wieder/fröhlich} Bergsteigen, weil die Sonne schien.
- (ii) Vor zwei Wochen war eine der drei Übersetzerinnen {wieder/fröhlich} Bergsteigen, weil die Sonne schien.
- (6) a. (i) Jesse, Lars und Dan spielen gemeinsam Baseball. Jesse und Lars waren vor zwei Monaten zum ersten Mal Schneewandern, während Dan noch nie Schneewandern war.
- (ii) Jesse, Lars und Dan spielen gemeinsam Baseball. Jesse und Lars waren vor zwei Monaten zum ersten Mal Schneewandern, während

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- Dan schon oft Schneewandern war.
- b. (i) Vor einer Woche war jeder der drei Baseballspieler {wieder/abends} Schneewandern, weil ein Schneewanderkurs angeboten wurde.
- (ii) Vor einer Woche war einer der drei Baseballspieler {wieder/abends} Schneewandern, weil ein Schneewanderkurs angeboten wurde.
- (7) a. (i) Alina, Livia und Mia besitzen eine Katze. Alina und Livia waren vor einer Woche Salsa tanzen, während Mia noch nie Salsa tanzen war.
- (ii) Alina, Livia und Mia besitzen eine Katze. Alina und Livia waren vor einer Woche Salsa tanzen, während Mia vor zwei Wochen Salsa tanzen war.
- b. (i) Vor zwei Tagen war jede der drei Katzenbesitzerinnen {wieder/mittags} Salsa tanzen, weil ein berühmter Salsalehrer in der Stadt war.
- (ii) Vor zwei Tagen war eine der drei Katzenbesitzerinnen {wieder/mittags} Salsa tanzen, weil ein berühmter Salsalehrer in der Stadt war.
- (8) a. (i) Bernd, Hannes und Johann sind zusammen in einem Naturschutzverein. Bernd und Hannes waren vor vier Monaten Sterne beobachten, während Johann bisher noch nie Sterne beobachtet hat.
- (ii) Bernd, Hannes und Johann sind zusammen in einem Naturschutzverein. Bernd und Hannes waren vor vier Monaten Sterne beobachten, während Johann bisher noch nie Sterne beobachtet hat.
- b. (i) Gestern war jeder der drei Naturschützer {wieder/abends} Sterne beobachten, weil es eine Sternenklare Nacht war.
- (ii) Gestern war einer der drei Naturschützer {wieder/abends} Sterne beobachten, weil es eine Sternenklare Nacht war.
- (9) a. (i) Kim, Franziska und Claudie machen gerade ihren Führerschein. Kim und Franziska waren vor einem Monat zusammen Trampolin springen, während Claudie noch nie Trampolin springen war.
- (ii) Kim, Franziska und Claudie machen gerade ihren Führerschein. Kim und Franziska waren vor einem Monat zusammen Trampolinspringen, während Claudie vor zwei Wochen Trampolinspringen war.

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- b. (i) Vor einer Woche war jede der drei Fahrschülerinnen {wieder/tüchtig} Trampolinspringen, weil man dort seine Reflexe trainieren kann.
 - (ii) Vor einer Woche war eine der drei Fahrschülerinnen {wieder/tüchtig} Trampolinspringen, weil man dort seine Reflexe trainieren kann.
- (10)
- a. (i) Tom, Severin und Bernhard fahren oft zusammen Motorrad. Tom und Severin waren vor vier Wochen zum ersten Mal zusammen Blaubeeren pflücken, während Bernhard bis dahin noch nie Blaubeeren pflücken war.
 - (ii) Tom, Severin und Bernhard fahren oft zusammen Motorrad. Tom und Severin waren vor vier Wochen zum ersten Mal zusammen Blaubeeren pflücken, während Bernhard schon des fteren Blaubeeren pflücken war.
- b. (i) Gestern war jeder der drei Motorradfahrer {wieder/eifrig} Blaubeeren pflücken, und am Abend gab es Blaubeerpfannkuchen.
 - (ii) Gestern war einer der drei Motorradfahrer {wieder/eifrig} Blaubeeren pflücken, und am Abend gab es Blaubeerpfannkuchen.
- (11)
- a. (i) Sue, Martina und Kathi erzählen gerne Geschichten. Vorletzte Woche waren Sue und Martina gemeinsam Motorradfahren, während Kathi noch nie Motorradfahren war.
 - (ii) Sue, Martina und Kathi erzählen gerne Geschichten. Vorletzte Woche waren Sue und Martina gemeinsam Motorradfahren, während Kathi einen Tag später Motorradfahren war.
- b. (i) Gestern war jede der drei Geschichtenerzählerinnen {wieder/mittags} Motorradfahren, weil es in der Nähe ein Motorradtreffen gab.
 - (ii) Gestern war eine der drei Geschichtenerzählerinnen {wieder/mittags} Motorradfahren, weil es in der Nähe ein Motorradtreffen gab.
- (12)
- a. (i) Olli, Markus und Michael sind Professoren an der Uni. Vor drei Wochen waren Olli und Markus Tontauben schießen, während Michael krank im Bett lag.
 - (ii) Olli, Markus und Michael sind Professoren an der Uni. Vor drei Wochen waren Olli und Markus Tontauben schießen, während Michael

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- alleine Tontauben schießen war.
- b. (i) Vor einer Woche war jeder der drei Professoren {wieder/begeistert} Tontauben schießen, weil die Uni dazu eingeladen hatte.
- (ii) Vor einer Woche war einer der drei Professoren {wieder/begeistert} Tontauben schießen, weil die Uni dazu eingeladen hatte.
- (13) a. (i) Sanna, Frauke und Sonja haben alle drei einen Dackel. Letzte Woche waren Sanna und Frauke zum ersten Mal Achterbahnfahren, während Sonja Babysitten musste.
- (ii) Sanna, Frauke und Sonja haben alle drei einen Dackel. Letzte Woche waren Sanna und Frauke zum ersten Mal Achterbahnfahren, während Sonja vorletzte Woche Achterbahnfahren war.
- b. (i) Vor zwei Tagen war jede der drei Dackelbesitzerinnen {wieder/einmal} Achterbahnfahren, weil ein Freizeitpark Tag der offenen Tür hatte.
- (ii) Vor zwei Tagen war eine der drei Dackelbesitzerinnen {wieder/einmal} Achterbahnfahren, weil ein Freizeitpark Tag der offenen Tür hatte.
- (14) a. (i) Sepp, Jörn und Raul machen derzeit ein Praktikum. Sepp und Jörn waren vor einem Jahr zum ersten Mal Segelfliegen, während Raul noch nie Segelfliegen war.
- (ii) Sepp, Jörn und Raul machen derzeit ein Praktikum. Sepp und Jörn waren vor einem Jahr zum ersten Mal Segelfliegen, während Raul regelmäßig Segelfliegen geht.
- b. (i) Dieses Jahr war jeder der drei Praktikanten {wieder/kurz} Segelfliegen, weil Segelfliegen voll im Trend liegt.
- (ii) Dieses Jahr war einer der drei Praktikanten {wieder/kurz} Segelfliegen, weil Segelfliegen voll im Trend liegt.
- (15) a. (i) Martha, Katharina und Eva promovieren in Linguistik. Vorletzte Woche waren Martha und Katharina Schlittenfahren, während Eva arbeiten musste.
- (ii) Martha, Katharina und Eva promovieren in Linguistik. Vorletzte Woche waren Martha und Katharina Schlittenfahren, während Eva vor einer Wochen Schlittenfahren war.

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- b. (i) Gestern war jede der drei Doktorandinnen {wieder/freudig} Schlittenfahren, weil es über Nacht geschneit hat.
 - (ii) Gestern war eine der drei Doktorandinnen {wieder/freudig} Schlittenfahren, weil es über Nacht geschneit hat.
- (16)
- a. (i) Samuel, Uwe und Harry sind Komiker. Letzten Sommer waren Samuel und Uwe Ponyreiten, während Harry an einem neuen Programm gearbeitet hat.
 - (ii) Samuel, Uwe und Harry sind Komiker. Letzten Sommer waren Samuel und Uwe Ponyreiten, während Harry letzten Herbst Ponyreiten war.
 - b. (i) Dieses Frühjahr war jeder der der Komiker {wieder/täglich} Ponyreiten, als ein Zirkus in der Stadt war.
 - (ii) Dieses Frühjahr war einer der der Komiker {wieder/täglich} Ponyreiten, als ein Zirkus in der Stadt war.
- (17)
- a. (i) Anthea, Ulrike und Nadja sind in einem Ruderverein. Anthea war vor drei Tagen Inlineskaten, während Ulrike und Nadja noch nie Inlineskaten waren.
 - (ii) Anthea, Ulrike und Nadja sind in einem Ruderverein. Anthea war vor drei Tagen Inlineskaten, während Ulrike und Nadja letztes Wochenende Inlineskaten waren.
 - b. (i) Gestern war jede der drei Ruderinnen {wieder/nachmittags} Inlineskaten, weil der Ruderverein ein Fest hatte.
 - (ii) Gestern war eine der drei Ruderinnen {wieder/nachmittags} Inlineskaten, weil der Ruderverein ein Fest hatte.
- (18)
- a. (i) Felix, Frederik und Victor gehen gerne in die Disco. Felix und war letzten Monat zum ersten Mal Raclette gegessen, während Frederik und Victor noch nie Raclette essen waren.
 - (ii) Felix, Frederik und Victor gehen gerne in die Disco. Felix war letzten Monat zum ersten Mal Raclette gegessen, während Frederik und Victor ab und zu Raclette essen gehen.
 - b. (i) Vorige Woche war jeder der drei Discogänger {wieder/begeistert} Raclette essen, weil in der Stadt ein Markt mit schweizer Spezialitäten

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- war.
- (ii) Vorige Woche war einer der drei Discogänger {wieder/begeistert} Raclette essen, weil in der Stadt ein Markt mit schweizer Spezialitäten war.
- (19) a. (i) Pauline, Stephanie und Charlotta ernähren sich hauptsächlich von Rohkost. Letztes Semester war Pauline Bungeespringen, während Stephanie und Charlotta bisher nicht Bungeespringen waren.
- (ii) Pauline, Stephanie und Charlotta ernähren sich hauptsächlich von Rohkost. Letztes Semester war Pauline Bungeespringen, während Stephanie und Charlotta vorletztes Semester Bungeespringen war.
- b. (i) Dieses Semester war jede der drei Rohköstlerinnen {wieder/einmal} Bungeespringen, weil ein Ausflug an der Uni angeboten wurde.
- (ii) Dieses Semester war eine der drei Rohköstlerinnen {wieder/einmal} Bungeespringen, weil ein Ausflug an der Uni angeboten wurde.
- (20) a. (i) Marian, Samuel und Christopher spielen gemeinsam Hockey. Letzten Mittwoch war Marian Golf spielen, während Samuel und Christopher beim Hockeytraining waren.
- (ii) Marian, Samuel und Christopher spielen gemeinsam Hockey. Letzten Mittwoch war Marian Golf spielen, während Samuel und Christopher letzten Donnerstag mit einem Freund Golf spielen waren.
- b. (i) Heute war jeder der drei Hockeyspieler {wieder/morgens} Golf spielen, weil es ein Benefizturnier im Nachbarort gab.
- (ii) Heute war einer der drei Hockeyspieler {wieder/morgens} Golf spielen, weil es ein Benefizturnier im Nachbarort gab.
- (21) a. (i) Melanie, Marion und Iris haben eine Leidenschaft fürs Joggen. Vor zwei Wochen war Melanie zum ersten Mal Tennisspielen, während Marion und Iris lieber Joggen waren.
- (ii) Melanie, Marion und Iris haben eine Leidenschaft fürs Joggen. Vor zwei Wochen war Melanie zum ersten Mal Tennisspielen, während Marion und Iris jeden Dienstag Tennisspielen gehen.

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- b. (i) Vor vier Tagen war jede der drei Joggerinnen {wieder/lange} Tennis spielen, weil ein neuer Tennisplatz eröffnet wurde.
 - (ii) Vor vier Tagen war eine der drei Joggerinnen {wieder/lange} Tennis spielen, weil ein neuer Tennisplatz eröffnet wurde.
- (22)
- a. (i) Matti, David und Daniel sind in einem Hobbygärtnerverein. Letzten Winter war Matti Go-Kart fahren, während David und Daniel lieber zu Hause blieben.
 - (ii) Matti, David und Daniel sind in einem Hobbygärtnerverein. Letzten Winter war Matti Go-Kart fahren, während David und Daniel letzten Herbst Go-Kart fahren waren.
 - b. (i) Diesen Sommer war jeder der drei Hobbygärtner {wieder/einmal} Go-Kart fahren, weil der Gartenverein einen Ausflug gemacht hat.
 - (ii) Diesen Sommer war einer der drei Hobbygärtner {wieder/einmal} Go-Kart fahren, weil der Gartenverein einen Ausflug gemacht hat.
- (23)
- a. (i) Heide, Nathalia und Daniela legen in der Freizeit gerne Tarotkarten. Heide war letztes Wochenende Langlaufen, während Nathalia und Daniela auf einer Familienfeier waren.
 - (ii) Heide, Nathalia und Daniela legen in der Freizeit gerne Tarotkarten. Heide war letztes Wochenende Langlaufen, während Nathalia und Daniela vorletztes Wochenende Langlaufen war.
 - b. (i) Vorgestern war jede der drei Kartenlegerinnen {wieder/mittags} Langlaufen, weil die Gemeinde neue Loipen gespurt hat.
 - (ii) Vorgestern war eine der drei Kartenlegerinnen {wieder/mittags} Langlaufen, weil die Gemeinde neue Loipen gespurt hat.
- (24)
- a. (i) Konstantin, Paul und Harald geben Aerobicstunden in einem Fitnesscenter. Konstantin war vorletzte Woche bei einer Bekannten Babysitten, während Paul und Harald einen Kurs unterrichtet haben.
 - (ii) Konstantin, Paul und Harald geben Aerobicstunden in einem Fitnesscenter. Konstantin war vorletzte Woche bei einer Bekannten Babysitten, während Paul und Harald letzte Woche Babysitten waren.

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- b. (i) Vorgestern war jeder der drei Aerobiclehrer {wieder/widerwillig} Babysitten, weil eine Freundin Hilfe brauchte.
- (ii) Vorgestern war einer der drei Aerobiclehrer {wieder/widerwillig} Babysitten, weil eine Freundin Hilfe brauchte.
- (25) a. (i) Angela, Rebecca und Carmen besuchen einen Sprachkurs in Spanisch. Angela hat letzten Dienstag Paella gekocht, während Rebecca und Carmen noch nie Paella gekocht haben.
- (ii) Angela, Rebecca und Carmen besuchen einen Sprachkurs in Spanisch. Angela hat letzten Dienstag Paella gekocht, während Rebecca und Carmen vorgestern Paella gekocht haben.
- b. (i) Gestern hat jede der drei Sprachschülerinnen {wieder/mittags} Paella gekocht, weil Muscheln im Angebot waren.
- (ii) Gestern hat eine der drei Sprachschülerinnen {wieder/mittags} Paella gekocht, weil Muscheln im Angebot waren.
- (26) a. (i) Sven, Erik und Michi spielen gemeinsam Hockey. Sven war vor zwei Wochen das erste Mal Schwimmen, während Erik und Michi noch nie Schwimmen waren.
- (ii) Sven, Erik und Michi spielen gemeinsam Hockey. Sven war vor zwei Wochen das erste Mal Schwimmen, während Erik und Michi schon oft Schwimmen waren.
- b. (i) Vorgestern war jeder der drei Hockeyspieler {wieder/abends} Schwimmen, weil Warmbadetag war.
- (ii) Vorgestern war einer der drei Hockeyspieler {wieder/abends} Schwimmen, weil Warmbadetag war.
- (27) a. (i) Margit, Petra und Elke spielen Geige in einem Orchester. Margit war vorgestern das erste Mal in einem syrischen Restaurant, während Petra und Elke noch nie in einem syrischen Restaurant waren.
- (ii) Margit, Petra und Elke spielen Geige in einem Orchester. Margit war vorgestern das erste Mal in einem syrischen Restaurant, während Petra und Elke vor zwei Wochen das erste Mal in einem syrischen Restaurant waren.

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- b. (i) Gestern war jede der drei Musikerinnen {wieder/mittags} syrisch Essen, weil sie Rabattgutscheine hatten.
- (ii) Gestern war eine der drei Musikerinnen {wieder/mittags} syrisch Essen, weil sie Rabattgutscheine hatten.
- (28) a. (i) Ingo, Franz und Heinz sind Mitglieder in einer Blaskapelle. Vor einem Jahr hat Ingo bei einem Schulfest Kastanienmännchen gebastelt, während Franz und Heinz noch nie Kastanienmännchen gebastelt haben.
- (ii) Ingo, Franz und Heinz sind Mitglieder in einer Blaskapelle. Vor einem Jahr hat Ingo bei einem Schulfest Kastanienmännchen gebastelt, während Franz und Heinz bei einer Wohltätigkeitsveranstaltung Kastanienmännchen gebastelt haben.
- b. (i) Am Wochenende hat jeder der drei Musiker {wieder/freudig} Kastanienmännchen gebastelt, weil die Blaskapelle Tag der offenen Tür hatte.
- (ii) Am Wochenende hat einer der drei Musiker {wieder/freudig} Kastanienmännchen gebastelt, weil die Blaskapelle Tag der offenen Tür hatte.

6.4 Reading Times for the Control Conditions in the Third Experiment

condition	Quantified NP <i>eine der</i> <i>drei Konferenzteilnehmerinnen</i>	indef. art. <i>einen</i>	crit. word <i>Laptop</i>	cw+1 <i>in</i>	cw+2 <i>einer</i>	cw+3 <i>Sitzung...</i>
three of three	219.7	217.9	213.3	208	229	268.1
two of three	219.9	224	215.6	218	227.8	262.3

Table 6.1: Mean first fixation duration in ms for *one...a*

6.4 Reading Times for the Control Conditions in the Third Experiment

condition	Quantified NP <i>eine der</i> <i>drei Konferenzteilnehmerinnen</i>	indef. art. <i>einen</i>	crit. word <i>Laptop</i>	cw+1 <i>in</i>	cw+2 <i>einer</i>	cw+3 <i>Sitzung...</i>
three of three	529	232.9	234.3	231.8	296.3	250.1
two of three	580.3	238.3	247.2	240.1	272	356

Table 6.2: Mean first pass duration in ms for *one...a*

condition	Quantified NP <i>eine der</i> <i>drei Konferenzteilnehmerinnen</i>	indef. art. <i>einen</i>	crit. word <i>Laptop</i>	cw+1 <i>in</i>	cw+2 <i>einer</i>	cw+3 <i>Sitzung...</i>
three of three	809	285	303.4	326.4	388	419.1
two of three	914.7	287.7	323.3	310.7	363.4	404.5

Table 6.3: Mean total duration in ms for *one...a*

condition	Quantified NP <i>jede der</i> <i>drei Konferenzteilnehmerinnen</i>	indef. art. <i>einen</i>	crit. word <i>Laptop</i>	cw+1 <i>in</i>	cw+2 <i>einer</i>	cw+3 <i>Sitzung...</i>
three of three	216.6	232.4	207.6	214.1	251.3	279.7
two of three	205.3	235.4	215.1	224	223.3	258.8

Table 6.4: Mean first fixation duration in ms for *each...a*

condition	Quantified NP <i>jede der</i> <i>drei Konferenzteilnehmerinnen</i>	indef. art. <i>einen</i>	crit. word <i>Laptop</i>	cw+1 <i>in</i>	cw+2 <i>einer</i>	cw+3 <i>Sitzung...</i>
three of three	590	252.8	241.6	256.3	311.1	365.2
two of three	546	256.3	255.1	252.8	284.8	344.8

Table 6.5: Mean first pass duration in ms for *each...a*

condition	Quantified NP <i>jede der</i> <i>drei Konferenzteilnehmerinnen</i>	indef. art. <i>einen</i>	crit. word <i>Laptop</i>	cw+1 <i>in</i>	cw+2 <i>einer</i>	cw+3 <i>Sitzung...</i>
three of three	780	284.3	301.1	260.6	351.6	415.4
two of three	748.7	298.9	330.6	297.8	349	417.5

Table 6.6: Mean total duration in ms for *each...a*

condition	Quantified NP <i>eine der</i> <i>drei Schauspielerinnen</i>	adverb <i>abends</i>	crit. word <i>Schlittschuhlaufen</i>	cw+1 <i>weil</i>	cw+2 <i>das</i>	cw+3 <i>Wetter...</i>
three of three	219.6	240.5	244.5	221.2	232.6	220.8
two of three	212.9	241.1	245.5	215.7	222.1	220

Table 6.7: Mean first fixation duration in ms for *one...adverb*

6. APPENDIX

condition	Quantified NP <i>eine der drei Schauspielerinnen</i>	adverb <i>abends</i>	crit. word <i>Schlittschuhlaufen</i>	cw+1 <i>weil</i>	cw+2 <i>das</i>	cw+3 <i>Wetter...</i>
three of three	635.2	264.2	298.6	239.7	260.7	258.8
two of three	654.9	276.8	311.4	250.4	246.3	297.6

Table 6.8: Mean first pass duration in ms for *one...adverb*

condition	Quantified NP <i>eine der drei Schauspielerinnen</i>	adverb <i>abends</i>	crit. word <i>Schlittschuhlaufen</i>	cw+1 <i>weil</i>	cw+2 <i>das</i>	cw+3 <i>Wetter...</i>
three of three	950.5	374.4	393.8	279.1	304.9	344.4
two of three	900.2	343.3	360	295.4	278.2	328.4

Table 6.9: Mean total in ms for *one...adverb*

condition	Quantified NP <i>jede der drei Schauspielerinnen</i>	adverb <i>abends</i>	crit. word <i>Schlittschuhlaufen</i>	cw+1 <i>weil</i>	cw+2 <i>das</i>	cw+3 <i>Wetter...</i>
three of three	213.7	242.6	243.2	229.8	217.8	211.4
two of three	209.1	245.5	232.4	214.7	214.3	206.3

Table 6.10: Mean first fixation duration in ms for *each...adverb*

condition	Quantified NP <i>jede der drei Schauspielerinnen</i>	adverb <i>abends</i>	crit. word <i>Schlittschuhlaufen</i>	cw+1 <i>weil</i>	cw+2 <i>das</i>	cw+3 <i>Wetter...</i>
three of three	247.4	245.7	242.8	349.6	265	620.3
two of three	263.3	280.8	229.5	318.4	274.4	624.4

Table 6.11: Mean first pass duration in ms for *each...adverb*

condition	Quantified NP <i>jede der drei Schauspielerinnen</i>	adverb <i>abends</i>	crit. word <i>Schlittschuhlaufen</i>	cw+1 <i>weil</i>	cw+2 <i>das</i>	cw+3 <i>Wetter...</i>
three of three	962.7	352.3	432.2	259	274.9	354.5
two of three	1000.5	363.8	409	269.7	343.3	357

Table 6.12: Mean total in ms for *each...adverb*

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Eigenständigkeitserklärung gemäß §5, Abs. 2 der Promotionsordnung

Ich erkläre hiermit, dass ich die zur Promotion eingereichte Arbeit mit dem Titel: **The Processing of *wieder* ('again') and other Presupposition Triggers** selbständig verfasst, nur die angegebenen Quellen und Hilfsmittel benutzt und wörtlich oder inhaltlich übernommene Stellen als solche gekennzeichnet habe. Ich versichere an Eides statt, dass diese Angaben wahr sind und dass ich nichts verschwiegen habe. Mir ist bekannt, dass die falsche Abgabe einer Versicherung an Eides statt mit Freiheitsstrafe bis zu drei Jahren oder mit Geldstrafe bestraft wird

Tübingen, den 08.10.2013